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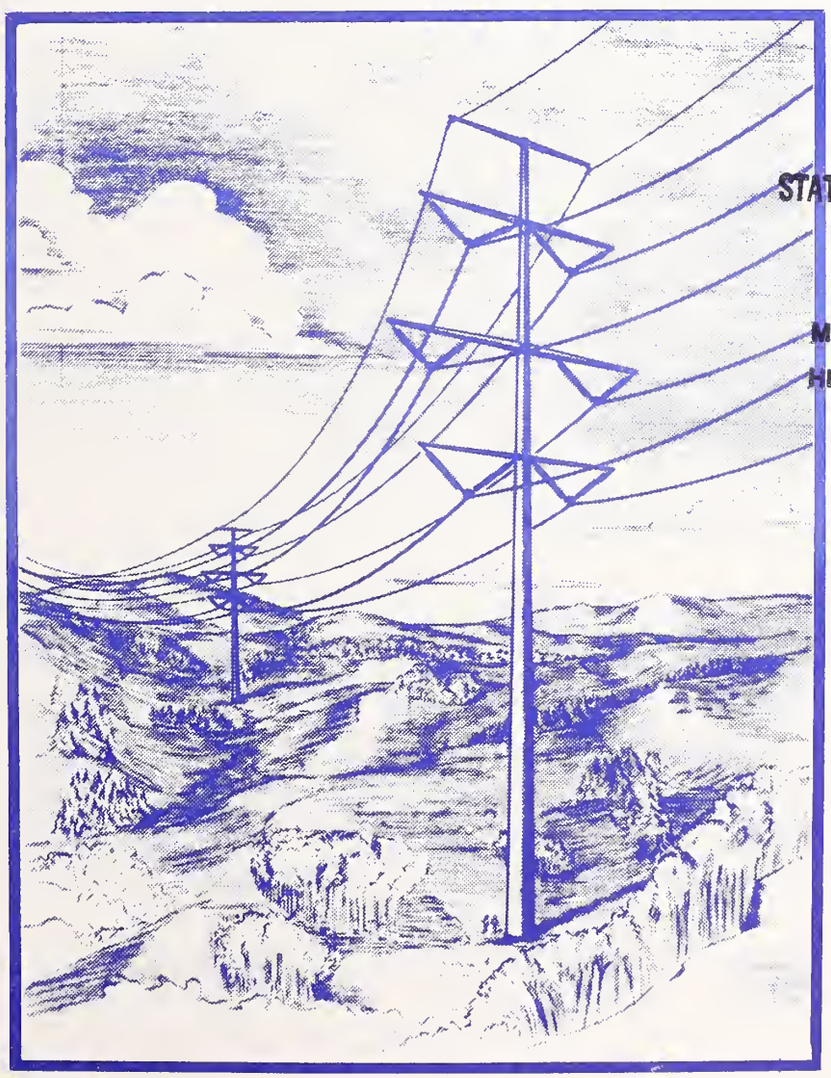
No. WC-4-15906-132

SPECIFICATIONS

GREAT FALLS-CONRAD 230-KV TRANSMISSION LINE



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These Specifications Issued
by the
Department of Energy
Western Area Power Administration
P.O. Box 3402
Golden, CO 80401

FOREWORD

The work consists of furnishing all materials and constructing a new single-circuit, 3-phase, 230-kilovolt transmission line on single pole, tubular steel or concrete structures, approximately 73.6 miles in length in Cascade, Teton and Pondera Counties, Montana. The conductor shall be non specular type, 945,000-circular mil, 45/7 stranding, ACSR. The line shall have one 1/2-inch, high strength galvanized steel overhead ground wire the entire length of line.

PHONE INQUIRIES REGARDING THESE SPECIFICATIONS
SHOULD BE MADE TO THE FOLLOWING:

Civil Design Division	(303) 231-1590
Electrical Design Division	(303) 231-1591
Construction and Inspection Division	(303) 231-1669
Contracting Officer (Inquiries regarding award)	(303) 231-7461
Assistant Area Manager for Construction, Huron, South Dakota	(605) 352-8651 Ext. 212

Contractors requiring technical clarification shall submit their questions in writing.

(Price $25.00)

TABLE OF CONTENTS

	Page
PART I - THE SCHEDULE	
SECTION A. Solicitation, Offer, and Award, Standard Form 1442 . . .	1
SECTION B. Supplies or Services and Prices	3
SECTION C. Description/Specifications	10
SECTION D. Packaging and Marking	10
SECTION E. Inspection and Acceptance	10
SECTION F. Deliveries or Performance	10
SECTION G. Contract Administration Data	11
SECTION H. Special Contract Requirements	12
PART II - CONTRACT CLAUSES	
SECTION I. Contract Clauses	27
PART III - LIST OF DOCUMENTS EXHIBITS AND OTHER ATTACHMENTS	
SECTION J. List of Documents, Exhibits, and other Attachments . . .	56
PART IV - REPRESENTATIONS AND INSTRUCTIONS	
SECTION K. Representations, Certifications, and other Statements of Bidders	57
SECTION L. Instructions, Conditions, and Notices to Bidders	66
SECTION M. Evaluation Factors for Award	79

TABLE OF CONTENTS

SECTION C.
DESCRIPTION/SPECIFICATIONS

DIVISION 1 - GENERAL REQUIREMENTS

SUBDIVISION 1.1--GENERAL CONDITIONS
- 1.1.1 The Requirement
- 1.1.2 Description of Work
- 1.1.3 Commencement, Prosecution, and Completion of Work
- 1.1.4 Construction Program
- 1.1.5 Construction Surveys
- 1.1.6 Definitions

SUBDIVISION 1.2--MATERIALS
- 1.2.1 Western-Furnished Materials
- 1.2.2 Contractor-Furnished Materials
- 1.2.3 Reference Specifications and Standards

SUBDIVISION 1.3--LOCAL CONDITIONS
- 1.3.1 Rights-of-Way
- 1.3.2 Access to the Work and Haul Routes
- 1.3.3 Use of Land for Construction Purposes
- 1.3.4 Existing Fences
- 1.3.5 Transmission, Telegraph, and Telephone Lines
- 1.3.6 Maintaining Public Traffic
- 1.3.7 Geologic Investigations
- 1.3.8 Electric Power for Construction Purposes
- 1.3.9 Water for Construction Purposes

SUBDIVISION 1.4--SAFETY AND HEALTH REQUIREMENTS
- 1.4.1 Accident Prevention Program
- 1.4.2 Safety of the Public
- 1.4.3 Medical Service
- 1.4.4 Employee Requirements
- 1.4.5 Personal Protective Equipment
- 1.4.6 Excavations
- 1.4.7 Explosives and Blasting
- 1.4.8 Materials Handling and Storage
- 1.4.9 Equipment
- 1.4.10 Grounds, Bonds, and Other Personnel Protective Devices
- 1.4.11 Clearances, Hot Line Orders, and Special Work Permits
- 1.4.12 Transmission Line Safety Requirements

SUBDIVISION 1.5--ENVIRONMENTAL QUALITY PROTECTION
- 1.5.1 Environmental Requirements
- 1.5.2 Landscape Preservation
- 1.5.3 Prevention of Water Pollution
- 1.5.4 Abatement of Air Pollution

1.5.5 Preservation of Historical and Archeological Data
1.5.6 Disposal of Waste Materials
1.5.7 Special Environmental Requirements

DIVISION 2 - SITEWORK

SUBDIVISION 2.1--CLEARING
2.1.1 Clearing, General
2.1.2 Clearing Criteria
2.1.3 Disposal of Cleared Material

SUBDIVISION 2.2--GRADING FOR LINE CLEARANCE AND DRAINAGE
2.2.1 Grading for Line Clearance and Drainage

SUBDIVISION 2.3--SITE DRANAGE
2.3.1 Corrugated Metal Pipe Culverts

SUBDIVISION 2.4--FENCING
2.4.1 Permanent Gates in Existing Fences
2.4.4 Fence Grounds

DIVISION 3 - STEEL OR CONCRETE POLES

SUBDIVISION 3.1--STEEL OR CONCRETE POLE STRUCTURES
3.1.1 General
3.1.2 Contractor Furnished Drawings and Data

SUBDIVISION 3.2--STEEL POLE STRUCTURES
3.2.1 Design Requirements
3.2.2 Materials
3.2.3 Quality Control
3.2.4 Nondestructive Testing of Welds
3.2.5 Fabrication
3.2.6 Marking
3.2.7 Galvanizing
3.2.8 Handling and Transportation
3.2.9 Installation

SUBDIVISION 3.3--CONCRETE POLE STRUCTURES
3.3.1 Design Requirements
3.3.2 Materials
3.3.3 Quality Control
3.3.4 Fabrication
3.3.5 Marking
3.3.6 Handling and Transportation
3.3.7 Installation

SUBDIVISION 3.4--GUYS AND ANCHORS
3.4.1 General
3.4.2 Design Requirements

TABLE OF CONTENTS - Continued

3.4.3 Materials
3.4.4 Installation

SUBDIVISION 3.5--CLIMBING PROVISIONS
3.5.1 General
3.5.2 Design Requirements
3.5.3 Installation

DIVISION 4 - ELECTRICAL

SUBDIVISION 4.1--ELECTRICAL, GENERAL
4.1.1 General
4.1.2 Items Requiring Special Attention

SUBDIVISION 4.2--CONDUCTOR INSULATOR ASSEMBLIES
4.2.1 General
4.2.2 Materials
4.2.3 Tests
4.2.4 Submittals
4.2.5 Installation

SUBDIVISION 4.3--ACCESSORIES FOR STEEL OR CONCRETE STRUCTURES
4.3.1 General
4.3.2 Materials and Installation

SUBDIVISION 4.4--CONDUCTOR, OVERHEAD GROUND WIRE, AND ACCESSORIES
4.4.1 Conductors
4.4.2 Overhead Ground Wire
4.4.3 Vibration Dampers
4.4.4 Hold-Down Weights

SUBDIVISION 4.5--TRANSMISSION LINES
4.5.1 Approach Spans

SUBDIVISION 4.6--DRAWINGS, DATA, AND TEST REPORTS
4.6.1 General
4.6.2 Drawings and Data
4.6.3 Reports of Tests

DIVISION 5 - DRAWINGS

SUBDIVISION 5.1--DRAWINGS
5.1.1 Drawings, General
5.1.2 List of Drawings

SECTION A

SOLICITATION, OFFER, AND AWARD (Construction, Alteration, or Repair)	1. SOLICITATION NO.	2. TYPE OF SOLICITATION	3. DATE ISSUED	PAGE OF PAGES
	DE-FB65-84WP15906	[X] ADVERTISED (IFB) [ ] NEGOTIATED (RFP)	7-18-84	1 of 79

IMPORTANT – The "offer" section on the reverse must be fully completed by offeror.

4. CONTRACT NO.	5. REQUISITION/PURCHASE REQUEST NO.	6. PROJECT NO.
		WC-4-15906-132

7. ISSUED BY CODE	8. ADDRESS OFFER TO
U.S. Department of Energy Western Area Power Administration P.O.-Box 3402, A1521, Linda K. Bell Golden, Colorado 80401	U.S. Department of Energy Western Area Power Administration Federal Building, Room 300 200 4th Street SW Huron, South Dakota 57350-2474

9. FOR INFORMATION CALL:	A. NAME	B. TELEPHONE NO. (Include area code) (NO COLLECT CALLS)
	Linda K. Bell	303-231-7590

SOLICITATION

NOTE: In advertised solicitations "offer" and "offeror" mean "bid" and "bidder".

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS (Title, identifying no., date):

CONSTRUCTION OF GREAT FALLS-CONRAD 230-KV TRANSMISSION LINE

CASCADE, TETON, AND PONDERA COUNTIES, MONTANA

SPECIFICATIONS NO. WC-4-15906-132

11. The Contractor shall begin performance within 30 calendar days and complete it within * calendar days after receiving [ ] award, [X] notice to proceed. This performance period is [X] mandatory, [ ] negotiable. (See *para. 1.1.3 of the technical specifications.)

12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS? (If "YES," indicate within how many calendar days after award in Item 12B.)	12B. CALENDAR DAYS
[X] YES [ ] NO	10

13. ADDITIONAL SOLICITATION REQUIREMENTS:

A. Sealed offers in original and 2 copies to perform the work required are due at the place specified in Item 8 by 11:00 a.m. (hour) local time 9-6-84 (date). If this is an advertised solicitation, offers will be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.

B. An offer guarantee [X] is, [ ] is not required.

C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.

D. Offers providing less than 60 calendar days for Government acceptance after the date offers are due will be considered nonresponsive and will be rejected.

OFFER *(Must be fully completed by offeror)*

14. NAME AND ADDRESS OF OFFEROR *(Include ZIP Code)*	15. TELEPHONE NO. *(Include area code)*
	16. REMITTANCE ADDRESS *(Include only if different than Item 14)*
CODE FACILITY CODE	

17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government within _____ calendar days after the date offers are due. *(Insert any number equal to or greater than the minimum requirement stated in Item 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.)*

AMOUNTS ▶

18. The offeror agrees (a) to carry out this offer if the Government accepts it by signing Item 31B within the time specified in Item 13D, and (b) to furnish any required performance and payment bonds.

19. ACKNOWLEDGMENT OF AMENDMENTS
(The offeror acknowledges receipt of amendments to the solicitation — give number and date of each)

AMENDMENT NO.										
DATE										

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER *(Type or print)*	20B. SIGNATURE	20C. OFFER DATE

AWARD *(To be completed by Government)*

21. ITEMS ACCEPTED:

22. AMOUNT	23. ACCOUNTING AND APPROPRIATION DATA

24. SUBMIT INVOICES TO ADDRESS SHOWN IN ▶ *(4 copies unless otherwise specified)*	ITEM 26	25. NEGOTIATED PURSUANT TO ☐ 10 USC 2304(a)( ) ☐ 41 USC 252(c)( )

26. ADMINISTERED BY CODE	27. PAYMENT WILL BE MADE BY
Assistant Area Manager for Construction Western Area Power Administration 200 4th Street SW, ATTN: B3000 Huron, SD 57350-2474	Finance and Accounting Branch Western Area Power Administration P.O. Box 3402, A1321 Golden, Colorado 80401

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

☐ 28. NEGOTIATED AGREEMENT *(Contractor is required to sign this document and return _____ copies to issuing office.)* Contractor agrees to furnish and deliver all items or perform all work, requisitions identified on this form and any continuation sheets for the consideration slated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications or incorporated by reference in or attached to this contract.

☐ 29. AWARD *(Contractor is not required to sign this document.)* Your offer on this solicitation, is hereby accepted as to the items listed. This award consummates the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.

30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN *(Type or print)*	31A. NAME OF CONTRACTING OFFICER *(Type or print)*

30B. SIGNATURE	30C. DATE	31B. UNITED STATES OF AMERICA BY	31C. AWARD DATE

SECTION B
SUPPLIES OR SERVICES AND PRICES

GREAT FALLS-CONRAD
230-KV TRANSMISSION LINE

PART A

Item No.	Work or Material	Estimated Quantity and Unit	Unit Price	Amount
	I BASE BID			
1.	Mobilization and preparatory work	For a lump sum not to exceed 5 percent of Total		$_____
2.	Corrugated metal pipe culverts, 18-inch diameter	132 feet	$_____	$_____
3.	Corrugated metal pipe culverts, 24-inch diameter	282 feet	$_____	$_____
4.	Corrugated metal pipe culverts, 30-inch diameter	30 feet	$_____	$_____
5.	Barbed wire gates on right-of-way	110 gates	$_____	$_____
6.	Barbed wire gates off right-of-way	10 gates	$_____	$_____
7.	Fence grounds for non-electric fences	250 each	$_____	$_____
	Steel or concrete pole structures as follows:			
8.	28L-55	9 each	$_____	$_____
9.	28L-60	24 each	$_____	$_____
10.	28L-65	15 each	$_____	$_____

PART A - Continued

Item No.	Work or Material	Estimated Quantity and Unit	Unit Price	Amount
	Steel or concrete pole structures (Continued)			
11.	28L-70	26 each	$_____	$_____
12.	28L-75	10 each	$_____	$_____
13.	28L-80	5 each	$_____	$_____
14.	28S-55	3 each	$_____	$_____
15.	28S-60	25 each	$_____	$_____
16.	28S-65	62 each	$_____	$_____
17.	28S-70	69 each	$_____	$_____
18.	28S-75	28 each	$_____	$_____
19.	28S-80	23 each	$_____	$_____
20.	28X-55	1 each	$_____	$_____
21.	28X-60	2 each	$_____	$_____
22.	28X-65	4 each	$_____	$_____
23.	28X-70	31 each	$_____	$_____
24.	28X-75	13 each	$_____	$_____
25.	28X-80	4 each	$_____	$_____
26.	28A-60	1 each	$_____	$_____
27.	28A-65	1 each	$_____	$_____
28.	28A-70	5 each	$_____	$_____
29.	28A-75	1 each	$_____	$_____
30.	28B-60	4 each	$_____	$_____
31.	28B-65	4 each	$_____	$_____

PART A - Continued

Item No.	Work or Material	Estimated Quantity and Unit	Unit Price	Amount
	Steel or concrete pole structures (Continued)			
32.	28B-70	2 each	$_____	$_____
33.	28B-75	4 each	$_____	$_____
34.	28B-80	1 each	$_____	$_____
35.	28C-60	1 each	$_____	$_____
36.	28C-65	1 each	$_____	$_____
37.	28C-70	1 each	$_____	$_____
38.	28C-75	1 each	$_____	$_____
39.	28D-55	5 each	$_____	$_____
40.	28D-60	1 each	$_____	$_____
41.	28D-65	1 each	$_____	$_____
42.	28D-70	3 each	$_____	$_____
43.	28N-55	3 each	$_____	$_____
44.	28N-60	1 each	$_____	$_____
45.	28N-65	1 each	$_____	$_____
46.	28N-70	1 each	$_____	$_____
47.	28N-80	1 each	$_____	$_____
48.	Spare davit arms	For the lump sum of		$_____
49.	Extra concrete backfill for steel poles	20 poles	$_____	$_____

PART A - Continued

Item No.	Work or Material	Estimated Quantity and Unit	Unit Price	Amount
50.	Rock backfill for concrete poles	20 poles	$_____	$_____
51.	Removable climbing provisions	For the lump sum of		$_____
	Insulator assemblies for 954,000-circular mil, ACSR, 45/7 conductor as follows:			
52.	Single-string suspension-type with 14 insulator units per assembly of 20,000-pounds M&E strength	767 assemblies	$_____	$_____
53.	Single-string suspension-type with 14 insulator units per assembly of 40,000-pounds M&E strength and with 2 suspension clamps and yoke plates	42 assemblies	$_____	$_____
54.	Single-string tension-type with 15 insulator units per assembly of 40,000 pounds M&E strength	90 assemblies	$_____	$_____
55.	Vee-string suspension type with 14 insulator units per leg of 20,000-pounds M&E strength	354 assemblies	$_____	$_____
56.	Horizontal line post insulator assembly with clamp	10 assemblies	$_____	$_____
57.	Stringing three 954,000-circular mil, ACSR, 45/7 nonspecular conductors	73.6 miles	$_____	$_____

PART A - Continued

Item No.	Work or Material	Estimated Quantity and Unit	Unit Price	Amount
58.	Stringing one 1/2-inch diameter high-strength steel, 7-wire overhead ground wire	73.6 miles	$_____	$_____
59.	Attaching stockbridge-type vibration dampers directly to 954,000-circular mil, ACSR conductors	1317 dampers	$_____	$_____
60.	Hold down weights, 50 pound	207 weights	$_____	$_____
61.	Furnishing all materials to complete the approach spans to Great Falls, Bole, and Conrad Substations.	For the lump sum of		$_____
62.	Assembling and installing all materials to complete the approach span to Great Falls Substation.	For the lump sum of		$_____
63.	Assembling and installing all materials to complete the approach spans to Bole Substation	For the lump sum of		$_____
64.	Assembling and installing all materials to complete the approach span to Conrad Substation	For the lump sum of		$_____
			TOTAL FOR BASE BID	$_____

PART A - Continued

Item No.	Work or Material	Estimated Quantity and Unit	Unit Price	Amount
*II.	ALTERNATE NO. 1			
65a.	Attaching stockbridge-type vibration dampers directly to 1/2-inch high strength, 7-strand overhead ground wires	439 dampers	$_____	$_____
*III.	ALTERNATE NO. 2			
65b.	Attaching preformed-type vibration dampers directly to 1/2-inch high strength, 7-strand overhead ground wires	2634 dampers	$_____	$_____
	TOTAL FOR BASE BID PLUS ALTERNATE NO. 1 OR NO. 2			$_____

*The bidder shall bid on either Alternate No. 1 or Alternate No. 2 at its option. A bid on both alternates is not required or desired. However, should the bidder bid on both alternates, the Government reserves the right to make award based on the lowest combination of Base Bid plus either alternative.

In Section H, paragraph 3, Limitation of Government's Obligation, is deleted. All funds are available and will be obligated at time of contract award.

SECTION B

SUPPLIES OR SERVICES AND PRICES

PART B

Bids must be entered for all items. Award of a contract will be made to only one Contractor. The Government reserves the right to make award for any or all items of any bid, unless the bidder qualifies such bid by specific limitation. The Government also reserves the right to make award to the bidder whose aggregate bid on any combination of bid items is low.

The Government further reserves the right to increase or decrease the quantity of any unit price item no more than 15 percent per item, at no change in the unit price specified by the bidder. All extensions of unit-priced items will be subject to verification by the Government. In case of variation between the unit price and the extension, the unit price will be considered to be the bid.

If a modification to a bid based on unit prices is submitted, which provides for a lump-sum adjustment to the total estimated cost, the application of the lump-sum adjustment to each unit price in the bid schedule must be stated. If it is not stated, the bidder agrees that the lump-sum adjustment shall be applied on a pro-rata basis to every unit price in the bid schedule.

When alternate items and/or performance schedules are set forth in this solicitation, the Government reserves the right to make award of the alternate items and/or performance schedule when price and other factors considered, it is determined that the alternate items and/or performance is in the best interest of the Government.

SECTION C

DESCRIPTION/SPECIFICATION

All supplies/services provided for under this contract shall be in accordance with the specifications included herein and contained immediately after Section M. Applicable technical specifications are numbered WC-4-15906-132 and contain applicable drawings.

SECTION D

PACKAGING AND MARKING

Packaging and marking shall be in acordance with the specifications, standards, and descriptions set forth in Section C, above.

SECTION E

INSPECTION AND ACCEPTANCE

Inspection and acceptance of the supplies or service to be furnished hereunder shall be made by:

Assistant Area Manager for Construction
Western Area Power Administration
200 4th Street, SW, ATTN: B3000
Huron, South Dakota 57350-2474

SECTION F

DELIVERIES OR PERFORMANCE

Performance of work shall be in accordance with the performance periods established in Specification No. WC-4-15906-132 (paragraph 1.1.3 entitled "Commencement, Prosecution, and Completion of Work").

SECTION G

CONTRACT ADMINISTRATION DATA

A. Reports required to be furnished under this contract shall be furnished to Assistant Area Manager for Construction, Western Area Power Administration, 200 4th Street, SW, Huron, South Dakota 57350-2474.

B. The accountable Property Officer designated to maintain property records in connection with this contract is Assistant Area Manager for Construction, Western Area Power Administration, 200 4th Street, SW, Huron, South Dakota 57350-2474.

C. Bonds: Performance and payment bonds are required in the following amounts:

1. Performance bond in the amount of

2. Payment bond in the amount of

SECTION H

SPECIAL CONTRACT REQUIREMENTS

1. LIQUIDATED DAMAGES - CONSTRUCTION (APR 1984)

   a. If the Contractor fails to complete the work within the time specified in the contract, or any extention, the Contractor shall pay to the Government as liquidated damages, the sum of $300.00 for each day of delay.

   b. If the Government terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the Government in completing the work.

   c. If the Government does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

2. PERFORMANCE OF WORK BY CONTRACTOR. SEE CLAUSE 43.

   The Contractor shall perform on the site and with its own organization work equivalent to at least 20 percent of the total amount of work to be performed under the contract.

3. LIMITATION OF GOVERNMENT'S OBLIGATION

   a. Of the total price of item(s) 1 through _____, the sum of $_____ is presently available and will be obligated at time of contract award for payment and contract. It is anticipated that funds will be allotted to this contract and obligated by contract amendment in accordance with the following schedule.

Fiscal Year	Percent of Bid
1985	

   The expected rate of funding shown herein is provided solely for informational purposes. The Contractor is cautioned that any schedule of operations which contemplates a different rate of funding is its own responsibility.

   b. The Contractor agrees to perform or have performed work on said items up to the point at which, in the event of termination of this contract pursuant to the clause hereof entitled "Termination for Convenience of the Government," the total amount payable by the Government (including amounts payable in respect of subcontracts and settlement costs), pursuant to paragragh (e) thereof, would in the exercise of reasonable judgment

by the Contractor approximate the total amount at the time allotted to the contract. The Government shall not be obligated in any event to pay or reimburse the Contractor in excess of the amount allotted to the contract, anything to the contrary in the clause hereof entitled "Termination for Convenience of the Government" notwithstanding.

c. It is contemplated that funds presently allotted to this contract will cover the work to be performed until _____. In the event funds allotted are considered by the Contractor to be inadequate to cover the work to be performed until the above date, or an agreed date in substitution thereof, the Contractor shall notify the Contracting Officer in writing when within the next 30 days the work will reach a point at which, in the event of termination of this contract pursuant to the clause hereof entitled "Termination for Convenience of the Government," the total amount payable by the Government (including amounts payable in respect of subcontracts and settlement costs) pursuant to paragraph e. thereof, will approximate 85 percent of the total amount then allotted to the contract. The notice shall state the estimated date when such point will be reached and the estimated amount of additional funds required to continue performance to the above or an agreed substituted date. The Contractor shall, 30 days prior to the date above the written or agreed substituted date, advise the Contracting Officer in writing as to the estimated amount of additional funds which will be required for the timely performance of the contract for further period, as may be specified in the contract or otherwise agreed to by the parties. If after such latter notification, additional funds are not allotted by the date above or by an agreed date in substitution thereof, the Contracting Officer will, upon written request of the Contractor, terminate this contract on such date or the date set forth in the request, whichever is later, pursuant to the provisions of the clause of this contract entitled "Termination for Convenience of the Government."

d. When additional funds are allotted for continued performance of the work under this contract, the parties shall agree on the applicable period of contract performance which shall be covered by such funds. The provisions of paragraphs b. and c. above shall apply to such additional allotted funds and substituted date pertaining thereto and the contract amended accordingly.

e. If the Contractor is delayed in the performance of the work under this contract, solely by reason of the failure of the Government to allot additional funds in amounts sufficient for the timely performance of this contract; and, if additional funds are allotted, an equitable adjustment shall be made in the performance time. Failure to agree to any such equitable adjustment hereunder shall be a dispute concerning a question of fact within the meaning of the clause in this contract entitled "Disputes."

f. The Government may at any time prior to termination, and with the consent of the Contractor after notice of termination, allot additional funds for this contract.

g. Nothing in this clause shall affect the right of the Government to terminate this contract pursuant to the clause of this contract entitled "Termination for Convenience of the Government."

4. BACKCHARGES TO CONTRACTOR

Where this contract provides for charges to the Contractor for costs incurred by the Government for services, materials, or use of equipment, such charges will include the costs of labor and materials, a reasonable allowance for use of plant and equipment, and other expenditures which can be directly assigned to the services or materials furnished, plus 15 percent of such total costs for Government overhead.

In the event of termination of the contract for default under the clause of this contract entitled "Termination for Default - Damages for Delay - Time Extensions," the increased costs occasioned by the Government thereunder shall include those administrative costs which are necessary for and directly assignable to completing the work following such termination and which would not have been required had termination not been necessary. In addition, the Government shall be entitled to 15 percent of the total of such administrative costs for Government overhead.

5. RIGHT TO OPERATE AND USE UNSATISFACTORY MATERIALS AND EQUIPMENT

If, after installation, the operation or use of the materials or equipment furnished by the Contractor fails to comply with the specifications of this contract, the Government shall have the right to operate or use such materials or equipment until correction of defects, errors, or omissions, by repair or by partial or complete replacement, can be made without interferring with Government operations.

6. PAYMENT DUE DATES - INVOICE REQUIREMENTS AND PENALTIES. SEE CLAUSE 40.

Payments will be due as follows:

Paragraph b	10 calendar days
Paragraph c	5 calendar days
Paragraph e	10 calendar days
Paragraph f	Original and 5

7. CONTRACT ADJUSTMENTS

Where adjustments are allowed for performance wholly or substantially by subcontractors or suppliers, such adjustments may include an allowance for the prime Contractor's indirect cost and profit. However, the total of such allowances for the prime Contractor's indirect cost and profit shall not exceed 10 percent of the adjustment allowed for the subcontractor or supplier. Where more than one tier of subcontractors or suppliers are involved in the performance, the total allowance for indirect cost and profit allowed for each tier shall not exceed 10 percent of the adjustment allowed for the subcontractor or supplier who wholly or substantially performs the work.

8. BREAKDOWN OF CONTRACT PRICES

In addition to the requirements of the General Provisions clause entitled "Payments under Fixed Price Construction Contracts", the Contractor shall submit for information a detailed breakdown of the total contract price within 30 calendar days after the date of the notice to proceed. The price breakdown shall be submitted in triplicate to the Western Area Power Administration, P.O. Box 3402, Golden, CO 80401, Attention: Code A2610. The breakdown of contract costs shall be arranged by bid item with a further more detailed division into the various kinds of work which make up the bid item. Whether there are few bid items or where there is only one lump-sum bid item, contract costs shall be furnished for the various kinds of work covered in the technical paragraphs of the specifications. The cost breakdown shall show the quantity of each type of work, the unit price and the total price therefor. The Contractor shall obtain cost information from his subcontractor as required to provide the Government with the actual breakdown of the bid price.

9. WAGE DETERMINATION

The wage rates set forth are the minimum rates which may be paid to the classifications of laborers and mechanics designated therein pursuant to the Davis-Bacon Act (Act of March 3, 1931, as amended; 40 U.S.C. 276a et seq.). DOE does not represent that said minimum rates do now, nor that they will at any time in the future, prevail in the locality of the work for such laborers or mechanics; not that such mechanics or laborers are or will be obtainable at said rates for work under this contract; nor that said rates represent the most recent wage determination by the Secretary of Labor with respect to such classification of laborers or mechanics in the locality of the work.

10. RATES OF WAGES

a. General. Pursuant to the provisions of the Davis-Bacon Act, 40 U.S.C. 276(a)-276(a)-7), as amended, the Secretary of Labor has determined that rates of wages and fringe benefits listed in this paragraph are

those prevailing for the classification specified in the locality of the work covered by the specifications. Refer to the General Provisions clause entitled "Construction Standards" for additional requirements.

b. Fringe Benefits. Fringe benefit payments include contributions, except those required by Federal, State, or local law, which the Contractor makes irrevocably to a trustee or a third party pursuant to any fund, plan, or program to provide for medical or hospital care compensation for injuries or illness resulting from occupational activity, unemployment benefits, life insurance, disability and sickness insurance, accident insurance (all designated as health and welfare), pensions, vacation and holiday pay, apprenticeship, or other similar programs, and other bona fide fringe benefits.

c. Local Labor Conditions. While the wage rates and fringe benefits shown are the minimum rates required by these specifications to be paid during the life of the contract, it is the responsibility of bidders to inform themselves as to local labor conditions such as the length of workday or workweek, overtime compensation, fringe benefit contributions, labor supply, and prospective changes or adjustments of wage rates or fringe benefits. No increase in the contract price will be allowed or authorized on account of the payment of wage rates or fringe benefits in excess of those listed therein.

d. List of Wage Rates. The classification, wage rates, and fringe benefits are listed hereinafter:

SUPERSEDEAS DECISION

STATE: Montana
DECISION NUMBER: MT83-5126
Supersedes Decision No. MT81-5138 dated August 7, 1981, in 46 FR 40439
DESCRIPTION OF WORK: Heavy and Highway Projects

COUNTIES: Statewide
DATE: Date of Publication

	Basic Hourly Rates	Fringe Benefits
BOILERMAKERS	$17.345	$3.00
CARPENTERS:		
Area 1:		
Carpenters	12.53	3.36
Millwrights	13.53	3.36
Piledrivermen	12.78	3.36
CEMENT MASONS:		
Cement Masons	12.28	1.95
Grinder, Brush Hammer and Chipping Gun when finishing work is to follow or to prepare a finished surface	12.43	1.95
Epoxy Work	12.58	1.95
ELECTRICIANS:		
Area 1	16.35	1.55+ 3-1/2%
Area 2:		
Electricians	18.05	1.55+ 3-1/2%
Cable Splicers	18.95	1.55+ 3-1/2%
Area 3:		
Electricians	15.15	1.80+ 3-1/2%
Cable Splicers	15.90	1.80+ 3-1/2%
Area 4	16.60	1.80+ 3-1/2%
Area 5:		
Electricians	17.20	1.80+ 3-1/2%
Cable Splicers	18.06	1.80+ 3-1/2%
Area 6:		
Electricians	18.95	1.35+ 3-1/2%
Cable Splicers	19.89	1.35+ 3-1/2%
Area 7:		
Electricians	15.40	1.55+ 3-1/2%
Cable Splicers	16.17	1.55+ 3-1/2%
Area 8:		
Electricians	15.40	1.55+ 3-1/2%
ELECTRICIANS: (Cont'd)		
Area 8: (Cont'd)		
Cable Splicers	$16.17	$1.55+ 3-1/2%
IRONWORKERS:		
Area 1	15.41	3.05
Area 2	17.74	4.15
Area 3	15.41	3.05
PAINTERS:		
Area 1:		
Brush or Roller, Prep work, Pot Tender	12.22	1.61
Wet Sandblasting, Brush or Roller application of cold tar, epoxies and acid resistant materials	14.22	1.61
Spray application of cold tar, epoxies and acid resistant materials	17.06	1.61
Structural Steel:		
Brush or Roller	14.55	1.61
Spraying	14.55	1.61
Airless Spraying	13.22	1.61
Area 2:		
Brush; Roller	12.62	1.81
Brush, Roller on Steel and roofs, Pot Tender	13.87	1.81
Spray (not steel)	13.62	1.81
Sandblaster, commerical and steel; Spray on structural steel and tanks	13.87	1.81
Area 3:		
Painter	10.52	
Paint Mitts	13.30	
Application of cold tar products, epoxies, polyurethanes and acid resistant paints; Water Sandblasting and Steam Cleaning; Stacks and Steeples; Brushing of steel; Spraying and airless spraying; work over 30 ft.	13.30	

DECISION NO. MT83-5126 Page 2

	Basic Hourly Rates	Fringe Benefits
PAINTERS: (Cont'd)		
Area 4:		
Painter, Brush, Preparatory work, Pot Tender, Roller up to 9 inches	$12.47	$1.54+ 10
Brush on steel	12.47	1.54+ 10
Water and Sandblasting; Application of cold tar products, epoxies, polyurethanes and acid resistant paints; Spraying and Airless Spray	14.72	1.54+ 10
Roller over 9" long	13.97	1.54+ 10
Signwriter	12.78	1.54+ 10
Spray and Roller	14.18	1.54+ 10
Area 5	10.90	
Area 6	15.42	1.81
Area 7:		
Highway parking and marking traffic surface applicator Operator; Material Mixer; Sandblaster; Striper	13.00	1.54
The installation of plastic, metal or compostion button, or lines used instead of paint		
PLUMBERS:		
Area 1	18.63	3.50
Area 2	17.45	2.42
Area 3	16.45	1.95
Area 4	18.60	2.45
SHEET METAL WORKERS	16.00	3.07
LABORERS:		
Group 1	10.60	2.50
Group 2	10.71	2.50
Group 3	10.85	2.50
Group 4	11.55	2.50
POWER EQUIPMENT OPERATORS: STATEWIDE		
A-Frame Truck Crane, Winch Truck and similar	$12.85	$3.19
Air Compressor, single	12.54	3.19
Air compressor, two or more	12.71	3.19
Air Doctor	13.01	3.19
Asphalt Paving Machine Operator	13.21	3.19
Asphalt Paving Machine Screed Operator	13.21	3.19
Automatic Pineqrader, Gurries and other similar types	13.34	3.19
Belt Finish Machine Operator	12.71	3.19
Bit Grinder	13.01	3.19
Bituminous Mixer Paving, Travel Plant	13.01	3.19
Boring Machine (small), Jeep, Pickup or Farm Tractor mounted	12.60	3.19
Boring Machine (large)	13.21	3.19
Broom, self-propelled	12.68	3.19
Cableway Highline Operator	13.72	3.19
Cement Silo Operator	12.80	3.19
Central Mixing Plants, Concrete dam and stationary	13.46	3.19
Chain Bucket Loader	12.73	3.19
Chip or Gravel Spreader, self-propelled	12.83	3.19
Concrete Batch Plant, one and two Mixers	13.21	3.19
Concrete Batch Plant, three and four Mixers	13.41	3.19
Concrete Batch Plant, five Mixers and over	13.61	3.19
Concrete Batch Plant Oiler, up to and including two Mixers	12.53	3.19
Concrete Batch Plant Oiler, three Mixers and over	12.84	3.19
Concrete Bucket Dispatcher	13.01	3.19
Concrete Curing Machine	13.01	3.19

DECISION NO. MT83-5126	Basic Hourly Rates	Fringe Benefits
POWER EQUIPMENT OPERATORS: (Cont'd)		
Concrete Finish Machine Paving	$13.21	$3.19
Concrete Float-Spreader	13.11	3.19
Concrete Mixer, three bags and under	12.60	3.19
Concrete Mixer, four bags and over	12.77	3.19
Concrete Power Saw, self-propelled	13.01	3.19
Concrete Travel Batcher	13.01	3.19
Concrete Conveyor under 40 feet	12.59	3.19
Concrete Conveyor over 40 feet	13.34	3.19
Concrete Pump	13.54	3.19
Conveyor Loader Operator, up to and including 42' belt	12.59	3.19
Conveyor Loader Operator over 42' belt	12.71	3.19
Crane, to and including 80' boom	13.37	3.19
Crane, 81' to 130' boom	13.52	3.19
Crane, 131' to 180' boom	13.57	3.19
Crane Oiler $.05 per hour is added for each 50 ft. of boom. Jibs to be included in Boom Length	12.58	3.19
Creter Crane	13.37	3.19
Crusher Operator	13.21	3.19
Crusher Oiler	12.50	3.19
Crusher Conveyor, when required	12.47	3.19
Distributor Operator	13.11	3.19
DW 10, 15, or 20 tractor pulling Roller	12.73	3.19
Electric Overhead Cranes	13.29	3.19
Elevating Grader	13.01	3.19
Farm type Tractor up to and including 50 HP Engine	12.47	3.19
Farm type Tractor, over 50 HP engine	12.55	3.19
Field Equipment Serviceman Fireman	13.13	3.19
Forklift, on construction job site	12.60	3.19
Form Grader Operator	12.82	3.19
Gradall Operator	12.78	3.19
Grade Setter	13.21	3.19
	12.47	3.19

Page 3	Basic Hourly Rates	Fringe Benefits
POWER EQUIPMENT OPERATORS: (Cont'd)		
Heavy Duty Drills, all types	$13.11	$3.19
Herman-Nelson Heaters and similar type	12.55	3.19
Hoist Operator, single drum	12.78	3.19
Hoist, two or more drums	13.01	3.19
Helicopter Hoist Operator	13.51	3.19
Hot Plant Operator	13.21	3.19
Hot Plant Fireman, when in operation	13.11	3.19
Hot Plant Oiler, 100 ton per hour or over	12.50	3.19
Hydra Lift and similar types	12.91	3.19
Industrial Locomotive all classes	13.21	3.19
Mechanic and/or Welder on job	13.31	3.19
Mechanic Shop (Dec. April 1)	12.66	3.19
Mixermobile	13.09	3.19
Motor Patrol Operator	13.34	3.19
Mountain Logger or similar type	13.01	3.19
Mucking Machine Operator	13.21	3.19
Oiler-Driver, Rubber tired Cranes	12.58	3.19
Oilers, other than Shovels and Cranes	12.98	3.19
Oiler, Hoist House, dams	12.91	3.19
Pavement Breakers, Emsco and similar	13.01	3.19
Paving and Mixing Machine	13.34	3.19
Power Auger, large truck or Tractor mounted and Punch	13.21	3.19
Power Mixer, single or double drum	13.01	3.19
Power Saw, multiple cut, self-propelled	13.01	3.19
Pumpcrete or Grout Machine	12.96	3.19
Pumpman	12.54	3.19
Push Tractor, Dozer or Side Boom, Rubber-Tired Dozer	13.21	3.19
Quad Cat	13.51	3.19
Quad Loader and similar type	13.79	3.19

DECISION NO. MT83-5126	Basic Hourly Rates	Fringe Benefits
POWER EQUIPMENT OPERATORS: (Cont'd)		
Radiator Repairman	$12.82	$3.19
Raygo Giant	13.79	3.19
Refrigeration Plant Operator	13.01	3.19
Retort Operator	12.60	3.19
Roller, on blade or hot mix oil paving	13.11	3.19
Roller, on other than hot mix oil paving	12.71	3.19
Roller, 25 ton or over	13.01	3.19
Ross and similar type Carriers, on construction site	13.11	3.19
Rubber-tired Front End Loader, 1 cu. yd. and under	12.92	3.19
Rubber-tired Front End Loader, 1 cu. yd. to and including 3 cu. yds.	13.21	3.19
Rubber-tired Front End Loader, over 3 cu. yds. to and including 5 cu. yds.	13.33	3.19
Rubber-tired Front End Loader, over 5 cu. yds. to and including 10 cu. yds.	13.43	3.19
Rubber-tired Front End Loader, over 10 yards to and including 15 yards	13.53	3.19
Rubber-tired Front End Loader, over 15 yards	13.63	3.19
Scraper, DW 15, 20, 21 and similar type if power unit is not used	13.11	3.19
Scraper, single or twin engine pulling Belly Dump Trailer	13.59	3.19
Scraper, single engine	13.34	3.19
Scraper, twin engine	13.44	3.19
Scraper, tandem engine or 3 engine	13.70	3.19
Self-propelled Sheepfoot and similar type	13.11	3.19
Shovels, including all attachments, under 1 cu. yd.	13.21	3.19
Shovels, including all attachments, 1 cu. yd. to and including 3 cu. yds.	13.39	3.19

Page 4	Basic Hourly Rates	Fringe Benefits
POWER EQUIPMENT OPERATORS: (Cont'd)		
Shovels, including all attachments, over 3 cu. yds. to and including 5 cu. yds.	$13.66	$3.19
Shovels, including all attachments over 5 cu. yds.	13.79	3.19
Shovel Oiler, 3 yds. and under	12.50	3.19
Shovel Oiler, over 3 cu. yds.	12.91	3.19
Skyhorse and Ringer Crane:		
250 ton thru 399 ton	14.37	3.19
400 ton thru 599 ton	15.37	3.19
600 ton and over	16.37	3.19
Slip Form Paver Operator	13.34	3.19
Stiff Leg Derrick and Guy Derrick	13.66	3.19
Tower Crane	13.37	3.19
Track-type Front End Loaders, up to and including 5 cu. yds!	13.21	3.19
Track-type Front End Loaders, over 5 cu. yds. to and including 10 cu. yds.	13.44	3.19
Track-type Front End Loaders, over 10 cu. yds. to and including 15 cu. yds.	13.54	3.19
Track-type Front End Loaders, over 15 cu. yds.	13.64	3.19
Track-type Tractor, on Euclid Loader	13.39	3.19
Trenching Machine	13.21	3.19
Turnhead Conveyor, or Head Tower on Batch Plant	13.01	3.19
Wagner Roller and similar type	13.01	3.19
Whirley Crane Operator	13.74	3.19
Whirley Crane Oiler	12.91	3.19
Water Pull when used for compaction	13.01	3.19
Washing and Screening Plant Operator	13.21	3.19
Washing and Screening Plant Oiler	12.50	3.19
Yo-Yo Cat, both ends	13.41	3.19

DECISION NO. MT83-5126	Basic Hourly Rates	Fringe Benefits
TRUCK DRIVERS: STATEWIDE		
COMBINATION TRUCK; Concrete Mixer and Trenait Mixer:		
To end including 4 cu. yds.	$13.75	$2.22
Over 4 cu. yds. to end including 6 cu. yds.	13.83	2.22
Over 6 cu. yds. to and including 8 cu. yds.	13.91	2.22
Over 8 cu. yds. to and including 10 cu. yds.	13.99	2.22
Over 10 cu. yds. - additionel $.08 per hour each additional 5 Batch increment		
DISTRIBUTOR DRIVER	13.73	2.22
DRY BATCH TRUCKS:		
3 Batch or under	13.50	2.22
Over 3 Batch to end including 5 Batch	13.63	2.22
Over 5 Batch to and including 10 Batch	13.79	2.22
Over 10 Batch to and including 15 Batch	13.95	2.22
Over 15 Batch-additionel 15¢ per hour each additional 5 Batch increment		
PICKUP DRIVER, HAULING MATERIALS	13.60	2.22
DUMPMAN, GRAVEL SPREADER BOX OPERATOR; Pilot Car Driver, Teamsters	13.50	2.22
DUMP TRUCKS And SIMILAR EQUIPMENT, DW 20, DW 21, or EUCLID TRACTORS, Pulling P.R. 21 or similar Dump Wagons:		
Water Level Capacity, including Sideboards:		
7 cu. yds. or less	13.50	2.22
Over 7 cu. yds. to and including 10 cu. yds.	13.63	2.22
Over 10 cu. yds. to and including 15 cu. yds.	13.79	2.22
Over 15 cu. yds. to and including 20 cu. yds.	13.93	2.22
Over 20 cu. yds. to end including 25 cu. yds.	13.99	2.22

Page 5	Basic Hourly Rates	Fringe Benefits
TRUCK DRIVERS: (Cont'd)		
Water Level Capacity, including Sideboards: (Cont'd):		
Over 25 cu. yds. to end including 30 cu. yds.	$14.05	$2.22
Over 30 cu. yds. to end including 35 cu. yds.	14.11	2.22
Over 35 cu. yds. to end including 40 cu. yds.	14.17	2.22
Over 40 cu. yds. to end including 45 cu. yds.	14.23	2.22
Over 45 cu. yds. - additionel $.10 per hour each additional 5 cu. yds. increment		
DUMPSTERS	13.63	2.22
POWER TRUCK DRIVER (bulk unloader type)	13.68	2.22
FLAT TRUCKS:		
To and including 3 tons	13.65	2.22
Over 3 tons factory rating	13.85	2.22
FUEL TRUCK DRIVERS; TIREMEN	14.09	2.22
LOWBOYS, FOUR-WHEEL TRAILER, FLOAT SEMI-TRAILER	13.85	2.22
LUMBER CARRIERS, LIFT TRUCK and FORK LIFTS	13.75	2.22
POWER BROOM	13.59	2.22
WATER TANK DRIVERS, PETROLEUM PRODUCTS DRIVERS:		
2,500 gallons and under	13.50	2.22
Over 2,500 gallons to and including 4,500 gallons	13.79	2.22
Over 4,500 gallons to and including 6,000 gallons	13.99	2.22
Over 6,000 gallons to and including 8,000 gallons	14.05	2.22
Over 8,000 gallons to and including 10,000 gallons	14.13	2.22
Over 10,000 gallons - additional $.10 per hour each additional 2,000 gallons increment		

DECISION NO. MT83-5126	Basic Hourly Rates	Fringe Benefits
TRUCK DRIVERS: (Cont'd)		
TRUCK MECHANIC	$14.49	$2.22
LINE CONSTRUCTION: Flathead, Lake and Lincoln Counties:		
All work for power utilities, all highway lighting, street lighting and motor traffic controlling.		
Lineman	17.15	.95+ 3-1/2%
Cable Splicers	19.09	.95+ 3-1/2%
Pole Sprayer	15.24	.95+ 3-1/2%
Line Equipment Operators	14.62	.95+ 3-1/2%
Jackhammer, Compressorman	11.89	.95+ 3-1/2%
Groundman "A"	10.81	.95+ 3-1/2%
Tree Trimmer	15.81	.95+ 3-1/2%
Powderman	12.67	.95+ 3-1/2%
Head Groundman and Groundmen "B" are not applicable		
Statewide, except Flathead, Lake, and Lincoln Counties:		
Lineman, Pole Sprayer	16.48	1.15+ 3-1/2%
Cable Splicers	17.61	1.15+ 3-1/2%
Line Equipment Operators' Powderman	14.59	1.15+ 3-1/2%
Groundman	11.86	1.15+ 3-1/2%

Page 6	Basic Hourly Rates	Fringe Benefits
WELDERS: Receive rate prescribed for craft performing operation to which welding is incidental		

AREA DESCRIPTIONS

CARPENTERS:
Area 1: Statewide excluding Beaverhead and Silver Bow Counties

ELECTRICIANS:
Area 1: Beaverhead, Deer Lodge, Granite, Jefferson, Madison, Silver Bow and Powell Counties
Area 2: Big Horn, Carbon, Carter, Dawson, Golden Valley, Musselshell, Powder River, Prairie, Rosebud, Stillwater, Treasure, Wibaux, and Yellowstone Counties
Area 3: Blaine, Chouteau, Daniels, Fergus, Glacier, Hill, Judith-Basin, Liberty, McCone, Petroleum, Pondera, Phillips, Richland, Roosevelt, Sheridan, Teton, Toole, Valley, and Wheatland Counties
Area 4: Broadwater, Lewis and Clark, and Meagher Counties
Area 5: Cascade County
Area 6: Flathead, Lake, Lincoln, Mineral, Missoula, Ravalli, and Sandere Counties
Area 7: Gallatin County
Area 8: Park and Sweet Grass Counties

IRONWORKERS:
Area 1: Beaverhead County, Broadwater County, Deer Lodge County, Gallatin County, Granite County, Jefferson County, Lewis & Clark County (southern half including Wolf Creek), Madison County, Park County, Powell County, Ravalli County, and Silver Bow County
Area 2: Flathead, Glacier, Lake, Lincoln, Mineral, Missoula, and Sanders Counties
Area 3: Remaining Counties (including northern half of Lewis & Clark County)

PAINTERS:
Area 1: The entire Counties of Beaverhead, Gallatin, Park and Silver Bow. The Northern portion of Jefferson County from a line running East and West (5) miles south of the southern City limits of Boulder, Montana; the south part of Jefferson County from a line running due west from the south limits of Toston, Montana; the Southern portion of Lewis & Clark County from a line running east and west through the southern limits of Craig, Montana; the Southern portion of Powell County from a line running east and west through the Southern limits of Helmsville, Montana; the west part of Madison County from a line running north and south through the west limits of Harrison, Montana.
Area 2: Big Horn, Carbon, Carter, Custer, Dawson, Fallon, Golden Valley, Musselshell, Powder River, Prairie, Rosebud, Stillwater, Sweetgrass and Treasure Counties; Wheatland County (south of the City of Harlowton); Wilbaux and Yellowstone Counties.
Area 3: Deer Lodge County and the southern part of Granite County from a line east-west through the southern limits of Phillipsburg

AREA DESCRIPTIONS (Cont'd)

PAINTERS: (Cont'd)
Area 4: Cascade County; Chouteau County (south of a line running east and west through the southern limits of Big Sandy); Daniels and Fergus Counties; Glacier County (including Glacier National Park); Garfield and Judith-Basin Counties; Lewis & Clark County (northern portion from a line running east and west through the northern limits of Craig), McCone, Phillips, Pondera, Petroleum, Richland, Roosevelt, Sheridan, Teton, Toole, and Valley Counties; Wheatland County (northern area from a line running east and west through the southern limits of Harlowtown)
Area 5: Blaine, Hill, and Liberty Counties; Chouteau County (north of the southern limits of the City of Big Sandy)
Area 6: Flathead County; Granite County (northern area north of City limits of Phillipsburg); Lake County (southern area including the City of Ronan); Lincoln, Mineral, and Missoula Counties; Powell County (northern area through south limits of Helmsville); Ravalli and Sanders Counties
Area 7: Statewide

PLUMBERS:
Area 1: Flathead, Lake, Lincoln, Mineral, Missoula, and Sanders Counties
Area 2: Blaine, Cascade, Chouteau, Fergus, Glacier, Hill Judith-Basin, Liberty, McCone, Meagher, Phillips, Pondera, Roosevelt, Teton, Toole, and Valley Counties
Area 3: Beaverhead, Broadwater, Deer Lodge, Gallatin, Granite, Jefferson, Lewis & Clark, Madison, Park, Powell, Silver Bow, and Sweet Grass Counties
Area 4: Big Horn, Carbon, Carter, Custer, Daniels, Dawson, Fallon, Garfield, Golden Valley, Musselshell, Petroleum, Powder River, Prairie Richland, Rosebud, Sheridan, Stillwater, Treasure, Wheatland, Wibaux, and Yellowstone Counties

SHEET METAL WORKERS:
Statewide

DECISION NO. MT83-5126 Page 9

CLASSIFICATIONS DESCRIPTIONS

LABORERS

Group 1: Axeman; Carpenter Tender; Car and Truck Loaders, Scissorman; Chuck Tender and Nipper (above ground); Cosmolene applying and removing; Dumpman (Spotter); Fence Erector and Installer (includes the installation and erection of fences, guard rails, median rails, reference posts, right-of-way markers and guide posts); Form Stripper; General Laborer - Heavy Highway, Highway Bridge and Structure, Crusher and Batch Plant Laborers; Heater Tender (not covered by joint board decision - such as radiant type of butane fire, without blowers or fans - General Laborers scale); Landscape Laborer; Riprap Tender; Stake Jumper for Equipment; Sandblaster Tail Hoseman, Pot Tender; Sod Cutter, hand operated (General Laborers); Tool Checker; Tool Houseman

Group 2: Burning Bar; Cement Mason Tender; Caisson Workers (free air); Cement Handlers; Choker Setter; Concrete Laborers (wet or dry); Bucketmen and Signalmen; Curb Machine; Dumpman (Grade Man); Form Setter; Hand Faller; Jackhammer, Pavement Breaker, Wagon Driller, Concrete Vibrator, Mechanical Tamper Vibrating Roller, hand steered and other power tools; Nozzleman - air, water; Gunite and Placo Machine; Concrete or Asphalt Saws; Pipelayer (all types); Laser equipment Operator; Pipewrapper; Posthole Digger (power auger); Power Saw (bucking); Powderman Tender; Power driven wheelbarrow; Rigger; Riprapper; Spiker Driver, single or dual or hand; Switchman; Tar Pot Operator

Group 3: Asphalt Raker; Concrete Vibrator (5" and over); Drills, Air Track, self-propelled, Cat and Truck mounted air operated Drills; Drills, Air Track with dual masts; Drills, Air Tract, self-propelled Mustang type and similar; Equipment Handler; High Scaler; High Pressure Machine Nozzleman; Power Saw (falling); Sandblaster

Group 4: Core Drill Operator; Grade Setter; Powderman; Cutting Torch and Air Arc Operator

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR, 5.5 (a)(1)(ii))

DECISION NO. MT83-5126 - Mod. 1 (48 FR 55254 - December 9 1983) Statewide, Montana		
CHANGE:		
CARPENTERS:		
Carpenter	$12.53	2.61
Millwrights	13.53	2.61
Piledrivermen	12.78	2.61
ELECTRICIANS:		
Area 2:		
Electrician	18.05	2.05+ 3-4B
Cable Splicers	18.95	2.05+ 3-4B

11. MOBILIZATION AND PREPARATORY WORK:

a. GENERAL: For the purposes of providing for expenses incident to the initiation of construction and discouraging unbalanced bidding, an item not to exceed 5 percent of total for the schedule has been included in the schedule to provide for payment for mobilization and preparatory work. The item for payment for mobilization and preparatory work is intended to compensate the Contractor for operations including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for the establishment of offices, buildings, plants and other facilities at the project site; for payment of premiums for bonds and insurance for the project; for any necessary costs of acquisition of equipment, including purchase and mobilization expense; and for any other work and operations which must be performed or costs that must be incurred incident to the initiation of meaningful work at the site and for which payment is not otherwise provided for under the contract.

b. FACILITIES AND EQUIPMENT COVERED BY MOBILIZATION WORK: All facilities, plant, and equipment which are established at or brought to the worksite shall be deemed to be subject to the provisons of this paragraph unless the Contracting Officer specifically provides otherwise in writing for a particular item or items. The Contractor shall be solely responsible for the adequacy, efficiency, use, protection, maintenance, repair, and preservation of all facilities, plant, and equipment. The facilities, plant, and equipment covered by this paragraph shall not be dismantled or removed from the worksite prior to completion of the work under the contract without the written permission of the Contracting Officer.

c. TERMINATION FOR DEFAULT: All facilities, plant, and equipment on the worksite shall also be subject to Western's right to take possession of and utilize the same for the purposes of completion of the work as provided by the General Provision clause entitled "Termination for Default" should the Contractor's right to proceed be terminated thereunder. In addition, any encumbrance, lien, or other security interest on any such facilities, plant, or equipment shall be subordinated to Western's rights under the General Provision clause titled "Terminiation for Default," to utilize all facilities, plant, and equipment to complete the work under the contract, and the Contractor agrees to provide evidence of this, acceptable to the Contracting Officer.

d. PAYMENT: Payment for mobilization and preparatory work will be made at the lump-sum price bid therefore in the schedule. Progress payment for mobilization and preparatory work will be made as follows:

(1) When 5 percent of the total original contract amount is earned from other schedule items, 50 percent of the amount bid for mobilization and preparatory work will be paid.

(2) When 10 percent of the total original contract amount is earned from other schedule items, the balance of the amount bid for mobilization and preparatory work will be paid.

Progress payments for mobilization and preparatory work shall be subject to retainage as provided by the General Provisions clause entitled "Payments to Contractor." In addition, the item for mobilization and preparatory work will not be considered to be a separate division of the work, completion of which would permit the payment of the complete item price without retention.

12. PROTECTION OF REAL ESTATE CROSSED BY RIGHT-OF-WAY

a. GENERAL: The Contractor shall limit the movement of his crews and equipment to the right-of-way, including access routes. The Contractor shall further limit movement on the right-of-way, so as to minimize damage to grazing land, crops, orchards, or property and shall avoid marring the lands. The Contractor shall be responsible for all damages off the right-of-way and shall settle all such damage claims directly with the property owner. Pursuant to the General Provisions clause titled "Permits and Responsibilities," the Contractor shall be responsible for all damages as a result of his fault or negligence.

b. RESTORATION OF LAND TO ORIGINAL CONDITIONS: When weather and ground conditions permit, the Contractor shall obliterate all Contractor-caused deep ruts that are hazardous to farming operations and to movement of equipment. Such ruts shall be leveled, filled and graded, or otherwise eliminated in an approved manner. Ruts, scars and compacted soils, in hay meadows, alfalfa fields, pastures, and cultivated productive lands shall have the soil loosened and leveled by scarifying, harrowing, disking, or other approved methods.

Damage to ditches, tile drains, terraces, roads, and other features of the land shall be corrected. At the end of each construction season and before final acceptance of the work, all ruts shall be obliterated and all trails and areas that are hard-packed as a result of Contractor operations shall be loosened and leveled. The land and facilities shall be restored as nearly as practicable to their original condition before final acceptance of the work.

c. HILLSIDE EROSION PREVENTION: Water turnoff bars or small terraces shall be constructed across all right-of-way trails on hillsides to prevent water erosion and to facilitate natural revegetation on the trails.

d. IRRIGATION DITCHES, DRAINAGE DITCHES, TERRACES AND TILE DRAINS: The Contractor shall take measures, especially during the irrigation season, to insure that his operations do no affect the operation of irrigation ditches, drainage ditches, terraces, and tile drains, and to insure that any other irrigation features are protected and maintained so that they will operate as required during the irrigation season.

e. RESOLUTION OF DAMAGE CLAIMS: The Contractor shall promptly notify the property owners of any damage which is his responsibility. The Contractor, within 60 days after his knowledge of or notice from a

landowner of damages off the right-of-way caused by his operations under this contract, shall notify the Contracting Officer's Technical Representative in writing as to his disposition of each such claim or his assumption of responsibility for damage. In order to adequately protect the Government against claims, demands, or liabilities arising out of the Contractor's construction operations under this contract the Contracting Officer may withhold such sums as he may deem appropriate from progress payments due the Contractor until the matter is settled. The Contracting Officer may also withhold final payment, or any part thereof until the Contractor presents satisfactory evidence that all claims which are the responsibility of the Contractor have been settled.

PART II

CONTRACT CLAUSES

(DOE SET 307)

FIXED PRICE CONSTRUCTION CONTRACTS

CONTENTS

			Page
1.	DEAR 952.202-1	DEFINITIONS-ALTERNATE I (APR 1984)	1
2.	FAR 52.203-1	OFFICIALS NOT TO BENEFIT (APR 1984)	1
3.	FAR 52.203-3	GRATUITIES (APR 1984)	1
4.	FAR 52.203-5	COVENANT AGAINST CONTINGENT FEES (APR 1984)	1
5.	DEAR 952.208-70	PRINTING (APR 1984)	1
6.	FAR 52.212-3	COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (APR 1984)	1
7.	FAR 52.212-12	SUSPENSION OF WORK (APR 1984)	1
8.	FAR 52.214-26	AUDIT-FORMAL ADVERTISING (APR 1984)	1
9.	FAR 52.214-27	PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA-MODIFICATIONS-FORMAL ADVERTISING (APR 1984)	2
10.	FAR 52.214-28	SUBCONTRACTOR COST OR PRICING DATA-MODIFICATIONS-FORMAL ADVERTISING (APR 1984)	2
11.	FAR 52.215-1	EXAMINATION OF RECORDS BY COMPTROLLER GENERAL (APR 1984)	2
12.	FAR 52.215-2	AUDIT-NEGOTIATION (APR 1984)	2
13.	DEAR 952.215-18	ORDER OF PRECEDENCE (APR 1984)	3
14.	FAR 52.215-22	PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA (APR 1984)	3
15.	FAR 52.215-23	PRICE REDUCTION FOR DEFECTIVE COST -MODIFICATIONS (APR 1984)	3
16.	FAR 52.215-24	SUBCONTRACTOR COST OR PRICING DATA (APR 1984)	3
17.	FAR 52.215-25	SUBCONTRACTOR COST OR PRICING DATA-MODIFICATIONS (APR 1984)	3
18.	FAR 52.219-8	UTILIZATION OF SMALL BUSINESS CONCERNS AND SMALL DISADVANTAGED BUSINESS CONCERNS (APR 1984)	3
19.	DEAR 952.219-9	SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING PLAN (APR 1984)	4
20.	FAR 52.219-13	UTILIZATION OF WOMEN-OWNED SMALL BUSINESSES (APR 1984)	5
21.	FAR 52.220-3	UTILIZATION OF LABOR SURPLUS AREA CONCERNS (APR 1984)	5
22.	FAR 52.220-4	LABOR SURPLUS AREA SUBCONTRACTING PROGRAM (APR 1984)	5
23.	FAR 52.222-1	NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (APR 1984)	5
24.	FAR 52.222-3	CONVICT LABOR (APR 1984)	5
25.	FAR 52.222-6	CONSTRUCTION STANDARDS-FPR TEMPORARY REGULATION NO. 70 (JUN 1983)	
26.	FAR 52.222-26	EQUAL OPPORTUNITY (APR 1984)	6
27.	FAR 52.222-27	AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION (APR 1984)	8
28.	FAR 52.222-28	EQUAL OPPORTUNITY PREAWARD CLEARANCE OF SUBCONTRACTS (APR 1984)	10
29.	FAR 52.222-35	AFFIRMATIVE ACTION FOR SPECIAL DISABLED AND VIETNAM ERA VETERANS (APR 1984)	10
30.	FAR 52.222-36	AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS (APR 1984)	11
31.	FAR 52.223-2	CLEAN AIR AND WATER (APR 1984)	11
32.	FAR 52.225-5	BUY AMERICAN ACT-CONSTRUCTION MATERIALS (APR 1984)	12
33.	FAR 52.228-2	ADDITIONAL BOND SECURITY (APR 1984)	12
34.	FAR 52.228-5	INSURANCE-WORK ON A GOVERNMENT INSTALLATION (APR 1984)	12
35.	FAR 52.229-3	FEDERAL, STATE, AND LOCAL TAXES (APR 1984)	12
36.	FAR 52.229-5	TAXES-CONTRACTS PERFORMED IN U.S. POSSESSIONS OR PUERTO RICO (APR 1984)	12

37.	DEAR 952.232-5	PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (APR 1984)	13
38.	FAR 52.232-17	INTEREST (APR 1984)	13
39.	FAR 52.232-23	ASSIGNMENT OF CLAIMS (APR 1984)	13
40.	DEAR 952.232-70	PAYMENT DUE DATES, INVOICE REQUIREMENTS AND PENALTIES-ALTERNATE II (APR 1984)	13
41.	DEAR 952.252-73	PAYMENTS METHODS (APR 1984)	14
42.	FAR 52.233-1	DISPUTES-ALTERNATE I (APR 1984)	14
43.	FAR 52.236-1	PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984)	14
44.	FAR 52.236-2	DIFFERING SITE CONDITIONS (APR 1984)	14
45.	FAR 52.236-3	SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK (APR 1984)	15
46.	FAR 52.236-5	MATERIAL AND WORKMANSHIP (APR 1984)	15
47.	FAR 52.236-6	SUPERINTENDENCE BY THE CONTRACTOR (APR 1984)	15
48.	FAR 52.236-7	PERMITS AND RESPONSIBILITIES (APR 1984)	15
49.	FAR 52.236-8	OTHER CONTRACTS (APR 1984)	15
50.	FAR 52.236-9	PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (APR 1984)	15
51.	FAR 52.236-10	OPERATIONS AND STORAGE AREAS (APR 1984)	15
52.	FAR 52.236-11	USE AND POSSESSION PRIOR TO COMPLETION (APR 1984)	16
53.	FAR 52.236-12	CLEANING UP (APR 1984)	16
54.	FAR 52.236-13	ACCIDENT PREVENTION (APR 1984)	16
55.	FAR 52.236-15	SCHEDULES FOR CONSTRUCTION CONTRACTS (APR 1984)	16
56.	FAR 52.236-17	LAYOUT OF WORK (APR 1984)	16
57.	FAR 52.236-21	SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (APR 1984)	16
58.	FAR 52.243-4	CHANGES (APR 1984)	17
59.	FAR 52.244-1	SUBCONTRACTS UNDER FIXED-PRICE CONTRACTS (APR 1984)	17
60.	FAR 52.245-2	GOVERNMENT PROPERTY-FIXED-PRICE CONTRACTS (APR 1984)	18
61.	FAR 52.246-12	INSPECTION OF CONSTRUCTION (APR 1984)	19
62.	FAR 52.246-21	WARRANTY OF CONSTRUCTION (APR 1984)	19
63.	FAR 52.247-63	PREFERENCE FOR U.S.-FLAG AIR CARRIERS (APR 1984)	20
64.	FAR 52.247-64	PREFERENCE FOR PRIVATELY OWNED U.S.-FLAG COMMERCIAL VESSELS (APR 1984)	20
65.	DEAR 952.247-70	FOREIGN TRAVEL (APR 1984)	20
66.	FAR 52.248-3	VALUE ENGINEERING-CONSTRUCTION (APR 1984)	20
67.	FAR 52.249-1	TERMINATION FOR CONVENIENCE OF THE GOVERNMENT -FIXED PRICE-SHORT FORM-ALTERNATE I (APR 1984)	21
68.	FAR 52.249-2	TERMINATION FOR CONVENIENCE OF THE GOVERNMENT-FIXED-PRICE - ALTERNATE I (APR 1984)	22
69.	FAR 52.249-10	DEFAULT-FIXED-PRICE CONSTRUCTION (APR 1984)	23

SUPPLEMENT

TO PART II - CONTRACT CLAUSES DOE SET 307
(FIXED-PRICE CONSTRUCTION CONTRACTS)

CONTENTS

			Page
70.	DOE PR 9-9.102-1	AUTHORIZATION AND CONSENT (JUN 1979).....	24
71.	DOE PR 9-9.103-1	PATENT INDEMNITY (JUN 1979).....	24
72.	DOE PR 9-9.103-3	PATENT INDEMNITY (JUN 1979).....	24
73.	DOE PR 9-9.104	NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT (JUN 1979).....	24
74.	DOE PR 9-9.110(c)	REPORTING OF ROYALTIES (JUN 1979).....	24
75.	DEAR 952.227-73	ADDITIONAL TECHNICAL DATA REQUIREMENTS (APR 1984).....	24
76.	DEAR 952.227-75	RIGHTS IN TECHNICAL DATA - LONG FORM (APR 1984).....	25
77.	DEAR 952.227-82	RIGHTS TO PROPOSAL DATA (APR 1984).....	26
78.	FAR 52.212-11	VARIATION IN ESTIMATED QUANTITY (APR 1984).	26

1. DEAR 952.202-1 DEFINITIONS-ALTERNATE I *(APR 1984)*

(a) The term "Head of Agency" means the Secretary, Deputy Secretary, or Under Secretary of the Department of Energy.

(b) "Contracting Officer" means a person with the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the Contracting Officer acting within the limits of their authority as delegated by the Contracting Officer.

(c) The term "DOE" means the Department of Energy.

2. FAR 52.203-1 OFFICIALS NOT TO BENEFIT *(APR 1984)*

No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this contract, or to any benefit arising from it. However, this clause does not apply to this contract to the extent that this contract is made with a corporation for the corporation's general benefit.

3. FAR 52.203-3 GRATUITIES *(APR 1984)*

(a) The right of the Contractor to proceed may be terminated by written notice if, after notice and hearing, the agency head or a designee determines that the Contractor, its agent, or another representative-

(1) Offered or gave a gratuity (e.g., an entertainment or gift) to an officer, official, or employee of the Government; and

(2) Intended, by the gratuity, to obtain a contract or favorable treatment under a contract.

(b) The facts supporting this determination may be reviewed by any court having lawful jurisdiction.

(c) If this contract is terminated under paragraph (a) above, the Government is entitled-

(1) To pursue the same remedies as in a breach of the contract; and

(2) In addition to any other damages provided by law, to exemplary damages of not less than 3 times nor more than 10 times the cost incurred by the Contractor in giving gratuities to the person concerned, as determined by the agency head or a designee. (This subparagraph (c)(2) is applicable only if this contract uses money appropriated to the Department of Defense.)

(d) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

4. FAR 52.203-5 COVENANT AGAINST CONTINGENT FEES *(APR 1984)*

(a) The Contractor warrants that no person or agency has been employed or retained to solicit or obtain this contract upon an agreement or understanding for a contingent fee, except a bona fide employee or agency. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or, in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of the contingent fee.

(b) "Bona fide agency," as used in this clause, means an established commercial or selling agency, maintained by a contractor for the purpose of securing business, that neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds itself out as being able to obtain any Government contract or contracts through improper influence.

"Bona fide employee," as used in this clause, means a person, employed by a contractor and subject to the contractor's supervision and control as to time, place, and manner of performance, who neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds out as being able to obtain any Government contract or contracts through improper influence.

"Contingent fee," as used in this clause, means any commission, percentage, brokerage, or other fee that is contingent upon the success that a person or concern has in securing a Government contract.

"Improper influence," as used in this clause, means any influence that induces or tends to induce a Government employee or officer to give consideration or to act regarding a Government contract on any basis other than the merits of the matter.

5. DEAR 952.208-70 PRINTING *(APR 1984)*

The contractor shall not engage in, nor subcontract for, any printing (as that term is defined in Title I of the U.S. Government Printing and Binding Regulations in effect on the effective date of this contract) in connection with the performance of work under this contract. Provided, however, that performance of a requirement under this contract involving the duplication of less than 5,000 copies of a single unit, or no more than 25,000 units in the aggregate of multiple units, will not be deemed to be printing. A unit is defined as one sheet, size 8 1/2 by 11 inches one side only, one color. A requirement is defined as a single publication document.

(1) The term "printing" includes the following processes: composition, plate making, presswork, binding, microform publishing, or the end items produced by such processes.

(2) If fulfillment of the contract will necessitate reproduction in excess of the limits set forth above, the contractor shall notify the contracting officer in writing and obtain the contracting officer's approval prior to acquiring on DOE's behalf production, acquisition, and dissemination of printed matter. Such printing must be obtained from the Government Printing Office (GPO), a contract source designated by GPO or a Joint Committee on Printing authorized federal printing plant.

(3) Printing services not obtained in compliance with this guidance will result in the cost of such printing being disallowed.

(4) The Contractor will include in each of his subcontracts hereunder a provision substantially the same as this clause including this paragraph (4).

6. FAR 52.212-3 COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK *(APR 1984)*

The Contractor shall be required to (a) commence work under this contract within *(See Section H of this contract)* (Contracting Officer insert number) calendar days after the date the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire work ready for use not later than *(See Section H of this contract)* The time stated for completion shall include final cleanup of the premises.

7. FAR 52.212-12 SUSPENSION OF WORK *(APR 1984)*

(a) The Contracting Officer may order the Contractor, in writing, to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the Government.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified in this contract (or within a reasonable time if not specified), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by the unreasonable suspension, delay, or interruption, and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor, or for which an equitable adjustment is provided for or excluded under any other term or condition of this contract.

(c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

8. FAR 52.214-26 AUDIT-FORMAL ADVERTISING *(APR 1984)*

NOTE: This clause applies to this contract if the original award resulted from the use of formal advertising.

(a) **Cost or pricing data.** If the Contractor has submitted cost or pricing data in connection with the pricing of any modification to this contract, unless the pricing was based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation, the Contracting Officer or a representative who is an employee of the Government shall have the right to examine and audit all books, records, documents, and other data of the Contractor (including

computations and projections) related to negotiating, pricing or performing the modification, in order to evaluate the accuracy, completeness, and currency of the cost or pricing data. In the case of pricing any modification, the Comptroller General of the United States or a representative who is an employee of the Government shall have the same rights.

(b) **Availability.** The Contractor shall make available at its office at all reasonable times the materials described in paragraph (a) above, for examination, audit, or reproduction, until 3 years after final payment under this contract, or for any other period specified in Subpart 4.7 of the Federal Acquisition Regulation (FAR). FAR Subpart 4.7, Contractor Records Retention, in effect on the date of this contract, is incorporated by reference in its entirety and made a part of this contract.

(1) If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for 3 years after any resulting final termination settlement.

(2) Records pertaining to appeals under the Disputes clause or to litigation or the settlement of claims arising under or relating to the performance of this contract shall be made available until disposition of such appeals, litigation, or claims.

(c) The Contractor shall insert a clause containing all the provisions of this clause, including this paragraph (c), in all subcontracts over $10,000 under this contract, altering the clause only as necessary to identify properly the contracting parties and the contracting.

9. FAR 52.214-27 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA-MODIFICATIONS-FORMAL ADVERTISING *(APR 1984)*

NOTE: This clause applies to this contract if the original award resulted from the use of formal advertising.

(a) This clause shall become operative only for any modification to this contract involving aggregate increases and/or decreases in costs, plus applicable profits, of more than $500,000 except that this clause does not apply to any modification for which the price is-

(1) Based on adequate price competition;

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(b) If any price, including profit, negotiated in connection with any modification under this clause, was increased by any significant amount because (1) the Contractor or a subcontractor furnished cost or pricing data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data, (2) a subcontractor or prospective subcontractor furnished the Contractor cost or pricing data that were not complete, accurate, and current as certified in the Contractor's Certificate of Current Cost or Pricing Data, or (3) any of these parties furnished data of any description that were not accurate, the price shall be reduced accordingly and the contract shall be modified to reflect the reduction. This right to a price reduction is limited to that resulting from defects in data relating to modifications for which this clause becomes operative under paragraph (a) above.

(c) Any reduction in the contract price under paragraph (b) above due to defective data from a prospective subcontractor that was not subsequently awarded the subcontract shall be limited to the amount, plus applicable overhead and profit markup, by which (1) the actual subcontract or (2) the actual cost to the Contractor, if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor; *provided*, that the actual subcontract price was not itself affected by defective cost or pricing data.

10. FAR 52.214-28 SUBCONTRACTOR COST OR PRICING DATA-MODIFICATIONS -FORMAL ADVERTISING *(APR 1984)*

NOTE: This clause applies to this contract if the original award resulted from the use of formal advertising.

(a) The requirements of paragraphs (b) and (c) of this clause shall (1) become operative only for any modification to this contract involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed $500,000 and (2) be limited to such modifications.

(b) Before awarding any subcontract expected to exceed $500,000 when entered into, or pricing any subcontract modification involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed $500,000, the Contractor shall require the subcontractor to submit cost or pricing data (actually or by specific identification in writing), unless the price is-

(1) Based on adequate competition;

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(c) The Contractor shall require the subcontractor to certify in substantially the form prescribed in subsection 15.804-4 of the Federal Acquisition Regulation that, to the best of its knowledge and belief, the data submitted under paragraph (b) above were accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract modification.

(d) The Contractor shall insert the substance of this clause, including this paragraph (d), in each subcontract that exceeds $500,000 when entered into.

11. FAR 52.215-1 EXAMINATION OF RECORDS BY COMPTROLLER GENERAL *(APR 1984)*

(a) This clause applies if this contract exceeds $10,000 and was entered into by negotiation.

(b) The Comptroller General of the United States or a duly authorized representative from the General Accounting Office shall, until 3 years after final payment under this contract or for any shorter period specified in Federal Acquisition Regulation (FAR) Subpart 4.7, Contractor Records Retention, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract.

(c) The Contractor agrees to include in first-tier subcontracts under this contract a clause to the effect that the Comptroller General or a duly authorized representative from the General Accounting Office shall, until 3 years after final payment under the subcontract or for any shorter period specified in FAR Subpart 4.7, have access to and the right to examine any of the subcontractor's directly pertinent books, documents, papers, or other records involving transactions related to the subcontract. "Subcontract," as used in this clause, excludes (1) purchase orders not exceeding $10,000 and (2) subcontracts or purchase orders for public utility services at rates established to apply uniformly to the public, plus any applicable reasonable connection charge.

(d) The periods of access and examination in paragraphs (b) and (c) above for records relating to (1) appeals under the Disputes clause, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the Comptroller General or a duly authorized representative from the General Accounting Office has taken exception shall continue until such appeals, litigation, claims, or exceptions are disposed of.

12. FAR 52.215-2 AUDIT-NEGOTIATION *(APR 1984)*

NOTE: This clause applies to this contract if the original award resulted from negotiation.

(a) **Examination of costs.**

If this is a cost-reimbursement, incentive, time-and-materials, labor-hour, or price-redeterminable contract, or any combination of these, the Contractor shall maintain-and the Contracting Officer or representatives of the Contracting Officer shall have the right to examine and audit-books, records, documents, and other evidence and accounting procedures and practices, sufficient to reflect properly all costs claimed to have been incurred or anticipated to be incurred in performing this contract. This right of examination shall include inspection at all reasonable times of the Contractor's plants, or parts of them, engaged in performing the contract.

(b) **Cost or pricing data.**

If, pursuant to law, the Contractor has been required to submit cost or pricing data in connection with pricing this contract or any modification to this contract, the Contracting Officer or representatives of the Contracting Officer who are employees of the Government shall have the right to examine and audit all books, records, documents, and other data of the Contractor (including computations and projections) related to negotiating, pricing, or performing the contract or modification, in order to evaluate the accuracy, completeness, and currency of the cost or pricing data. The right of examination shall extend to all documents necessary to permit adequate evaluation of the cost or pricing data submitted, along with the computations and projections used.

(c) **Reports.**

If the Contractor is required to furnish cost, funding, or performance reports, the Contracting Officer or representatives of the Contracting Officer who are employees of the Government shall have the right to examine and audit books, records, other documents, and supporting materials, for the purpose of evaluating (1) the effectiveness of the Contractor's policies and procedures to produce data compatible with the objectives of these reports and (2) the data reported.

(d) **Availability.**

The Contractor shall make available at its office at all reasonable times the materials described in paragraphs (a) and (b) above, for examination, audit, or reproduction, until 3 years after final payment under this contract, or for any shorter period specified in Subpart 4.7, Contractor Records Retention, of the Federal Acquisition Regulation, or for any longer period required by statute or by other clauses of this contract. In addition-

(1) If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for 3 years after any resulting final termination settlement; and

(2) Records relating to appeals under the Disputes clause or to litigation or the settlement of claims arising under or relating to this contract shall be made available until such appeals, litigation, or claims are disposed of.

(e) The Contractor shall insert a clause containing all the terms of this clause, including this paragraph (e), in all subcontracts over $10,000 under this contract, altering the clause only as necessary to identify properly the contracting parties and the Contracting Officer under the Government prime contract.

13. DEAR 952.215-18 ORDER OF PRECEDENCE *(APR 1984)*

In the event of an inconsistency between provisions of this contract, the inconsistency shall be resolved by giving precedence as follows: (a) schedule; (b) contract clauses; or (c) other provisions of the contract, whether incorporated by reference or otherwise.

14. FAR 52.215-22 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA *(APR 1984)*

(a) If any price, including profit or fee, negotiated in connection with this contract, or any cost reimbursable under this contract, was increased by any significant amount because (1) the Contractor or a subcontractor furnished cost or pricing data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data, (2) a subcontractor or prospective subcontractor furnished the Contractor cost or pricing data that were not complete, accurate, and current as certified in the Contractor's Certificate of Current Cost or Pricing Data, or (3) any of these parties furnished data of any description that were not accurate, the price or cost shall be reduced accordingly and the contract shall be modified to reflect the reduction.

(b) Any reduction in the contract price under paragraph (a) above due to defective data from a prospective subcontractor that was not subsequently awarded the subcontract shall be limited to the amount, plus applicable overhead and profit markup, by which (1) the actual subcontract or (2) the actual cost to the Contractor, if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor; *provided*, that the actual subcontract price was not itself affected by defective cost or pricing data.

15. FAR 52.215-23 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA-MODIFICATIONS *(APR 1984)*

(a) This clause shall become operative only for any modification to this contract involving a pricing adjustment expected to exceed $500,000, except that this clause does not apply to any modification for which the price is-

(1) Based on adequate price competition;

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(b) If any price, including profit or fee, negotiated in connection with any modification under this clause, or any cost reimbursable under this contract, was increased by any significant amount because (1) the Contractor or a subcontractor furnished cost or pricing data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data, (2) a subcontractor or prospective subcontractor furnished the Contractor cost or pricing data that were not complete, accurate, and current as certified in the Contractor's Certificate of Current Cost or Pricing Data, or (3) any of these parties furnished data of any description that were not accurate, the price or cost shall be reduced accordingly and the contract shall be modified to reflect the reduction. This right to a price reduction is limited to that resulting from defects in data relating to modifications for which this clause becomes operative under paragraph (a) above.

(c) Any reduction in the contract price under paragraph (b) above due to defective data from a prospective subcontractor that was not subsequently awarded the subcontract shall be limited to the amount, plus applicable overhead and profit markup, by which (1) the actual subcontract or (2) the actual cost to the Contractor, if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor; *provided*, that the actual subcontract price was not itself affected by defective cost or pricing data.

16. FAR 52.215-24 SUBCONTRACTOR COST OR PRICING DATA *(APR 1984)*

(a) Before awarding any subcontract expected to exceed $500,000 when entered into, or before pricing any subcontract modification involving a pricing adjustment expected to exceed $500,000, the Contractor shall require the subcontractor to submit cost or pricing data (actually or by specific identification in writing), unless the price is-

(1) Based on adequate price competition-

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(b) The Contractor shall require the subcontractor to certify in substantially the form prescribed in Subsection 15.804-4 of the Federal Acquisition Regulation (FAR) that, to the best of its knowledge and belief, the data submitted under paragraph (a) above were accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract modification.

(c) In each subcontract that exceeds $500,000 when entered into, the Contractor shall insert either-

(1) The substance of this clause, including this paragraph (c), if paragraph (a) above requires submission of cost or pricing data for the subcontract; or

(2) The substance of the clause at FAR 52.215-25, Subcontractor Cost or Pricing Data-Modifications.

17. FAR 52.215-25 SUBCONTRACTOR COST OR PRICING DATA-MODIFICATIONS *(APR 1984)*

(a) The requirements of paragraphs (b) and (c) of this clause shall (1) become operative only for any modification to this contract involving a pricing adjustment expected to exceed $500,000 and (2) be limited to such modifications.

(b) Before awarding any subcontract expected to exceed $500,000 when entered into, or pricing any subcontract modification involving a pricing adjustment expected to exceed $500,000, the Contractor shall require the subcontractor to submit cost or pricing data (actually or by specific identification in writing), unless the price is-

(1) Based on adequate price competition;

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(c) The Contractor shall require the subcontractor to certify in substantially the form prescribed in Subsection 15.804-4 of the Federal Acquisition Regulation (FAR) that, to the best of its knowledge and belief, the data submitted under paragraph (b) above were accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract modification.

(d) The Contractor shall insert the substance of this clause, including this paragraph (d), in each subcontract that exceeds $500,000 when entered into.

18. FAR 52.219-8 UTILIZATION OF SMALL BUSINESS CONCERNS AND SMALL DISADVANTAGED BUSINESS CONCERNS *(APR 1984)*

(a) It is the policy of the United States that small business concerns and small business concerns owned and controlled by socially and economically disadvantaged individuals shall have the maximum practicable opportunity to participate in performing contracts let by any Federal agency.

(b) The Contractor hereby agrees to carry out this policy in the awarding of subcontracts to the fullest extent consistent with efficient contract performance. The Contractor further agrees to cooperate in any studies or surveys as may be conducted by the United States Small Business Administration or the awarding agency of the United States as may be necessary to determine the extent of the Contractor's compliance with this clause.

(c) As used in this contract, the term "small business concern" shall mean a small business as defined pursuant to section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto. The term "small business concern owned and controlled by socially and economically disadvantaged individuals" shall mean a small business concern-

(1) Which is at least 51 percent owned by one or more socially and economically disadvantaged individuals; or, in the case of any publicly owned business, at least 51 per centum of the stock of which is owned by one or more socially and economically disadvantaged individuals; and

(2) Whose management and daily business operations are controlled by one or more of such individuals.

The Contractor shall presume that socially and economically disadvantaged individuals include Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Asian-Indian Americans and other minorities, or any other individual found to be disadvantaged by the Administration pursuant to section 8(a) of the Small Business Act.

(d) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as either a small business concern or a small business concern owned and controlled by socially and economically disadvantaged individuals.

19. DEAR 952.219-9 SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING PLAN *(APR 1984)*

NOTE: This clause applies to this contract only if the price exceeds $1,000,000.

(a) This clause does not apply to small business concerns.

(b) "Commercial product," as used in this clause, means a product in regular production that is sold in substantial quantities to the general public and/or industry at established catalog or market prices. It also means a product which, in the opinion of the Contracting Officer, differs only insignificantly from the Contractor's commercial product.

"Subcontract," as used in this clause, means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

(c) The offeror, upon request by the Contracting Officer, shall submit and negotiate a subcontracting plan, where applicable, which addresses separately subcontracting with small business concerns and small disadvantaged business concerns and which shall be included in and made a part of the resultant contract. The subcontracting plan shall be negotiated within the time specified by the Contracting Officer. Failure to submit and negotiate the subcontracting plan shall make the offeror ineligible for award of a contract.

Alternate paragraph (c): (NOTE: This paragraph (c) applies in lieu of the above paragraph (c) only if contracting by formal advertising.)

(c) The apparent lows bidder, upon request by the Contracting Officer, shall submit a subcontracting plan, where applicable, which addresses separately subcontracting with small business concerns and small disadvantaged business concerns, and which shall be included in and made part of the resultant contract. The subcontracting plan shall be submitted within the time specified by the Contracting Officer. Failure to submit the subcontracting plan shall make the bidder ineligible for award of a contract.

(d) The offeror's subcontracting plan shall include the following:

(1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business concerns and small disadvantaged business concerns as subcontractors. The offeror shall include all subcontracts that contribute to contract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.

(2) A statement of-

(i) Total dollars planned to be subcontracted;

(ii) Total dollars planned to be subcontracted to small business concerns; and

(iii) Total dollars planned to be subcontracted to small disadvantaged business concerns.

(3) A description of the principal types of supplies and services to be subcontracted, and an identification of the types planned for subcontracting to (i) small business concerns and (ii) small disadvantaged business concerns.

(4) A description of the method used to develop the subcontracting goals in (1) above.

(5) A description of the method used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Automated Source System (PASS) of the Small Business Administration, the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small and small disadvantaged business concerns trade associations).

(6) A statement as to whether or not the offeror included indirect costs in establishing subcontracting goals, and a description of the method used to determine the proportionate share of indirect costs to be incurred with (i) small business concerns and (ii) small disadvantaged business concerns.

(7) The name of the individual employed by the offeror who will administer the offeror's subcontracting program, and a description of the duties of the individual.

(8) A description of the efforts the offeror will make to assure that small business concerns and small disadvantaged business concerns have an equitable opportunity to compete for subcontracts.

(9) Assurances that the offeror will include the clause in this contract entitled "Utilization of Small Business Concerns and Small Disadvantaged Business Concerns" in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) who receive subcontracts in excess of $500,000 ($1,000,000 for construction of any public facility), to adopt a plan similar to the plan agreed to by the offeror.

(10) Assurances that the offeror will (i) cooperate in any studies or surveys as may be required, (ii) submit periodic reports in order to allow the Government to determine the extent of compliance by the offeror with the subcontracting plan, (iii) submit Standard Form (SF) 294, only (DOE contractors need not submit SF 295) on a quarterly basis no later than the last day of March, June, September and December, and upon contract completion, in accordance with the instructions on the form except the report shall be submitted quarterly rather than semiannually and additionally shall indicate at the remarks block the number and dollar amount of awards made to labor surplus area concerns, to the extent such reporting is required by the terms of their contract, and (iv) ensure that its subcontractors agree to submit SF 294 in accordance with the instructions at (iii) above.

(11) A recitation of the types of records the offeror will maintain to demonstrate procedures that have been adopted to comply with the requirements and goals in the plan, including establishing source lists; and a description of its efforts to locate small and small disadvantaged business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated):

(i) Source lists, guides, and other data that identify small and small disadvantaged business concerns.

(ii) Organizations contacted in an attempt to locate sources that are small or small disadvantaged business concerns.

(iii) Records on each subcontract solicitation resulting in an award of more than $100,000, indicating (A) whether small business concerns were solicited and if not, why not, (B) whether small disadvantaged business concerns were solicited and if not, why not, and (C) if applicable, the reason award was not made to a small business concern.

(iv) Records of any outreach efforts to contact (A) trade associations, (B) business development organizations, and (C) conferences and trade fairs to locate small and small disadvantaged business sources.

(v) Records of internal guidance and encouragement provided to buyers through (A) workshops, seminars, training, etc., and (B) monitoring performance to evaluate compliance with the program's requirements.

(vi) On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having company or division-wide annual plans need not comply with this requirement.

(e) In order to effectively implement this plan to the extent consistent with efficient contract performance, the Contractor shall perform the following functions:

(1) Assist small business and small disadvantaged business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by such concerns. Where the Contractor's lists of potential small business and small disadvantaged subcontractors are excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(2) Provide adequate and timely consideration of the potentialities of small business and small disadvantaged business concerns in all "make-or-buy" decisions.

(3) Counsel and discuss subcontracting opportunities with representatives of small and small disadvantaged business firms.

(f) A master subcontracting plan on a plant or division-wide basis which contains all the elements required by (d) above, except goals, may be incorporated by reference as a part of the subcontracting plan required of the offeror by this clause; *provided*, (1) the master plan has been approved, (2) the offeror provides copies of the approved master plan and evidence of its approval to the Contracting Officer, and (3) goals and any deviations from the master plan deemed necessary by the Contracting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.

(g) (1) If a commercial product is offered, the subcontracting plan required by this clause may relate to the offeror's production generally, for both commercial and noncommercial products, rather than solely to the Government contract. In these cases, the offeror shall, with the concurrence of the Contracting Officer, submit one company-wide or division-wide annual plan.

(2) The annual plan shall be reviewed for approval by the agency awarding the offeror its first prime contract requiring a subcontracting plan during the fiscal year, or by an agency satisfactory to the Contracting Officer.

(3) The approved plan shall remain in effect during the offeror's fiscal year for all of the offeror's commercial products.

(h) Prior compliance of the offeror with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.

(i) The failure of the Contractor or subcontractor to comply in good faith with (1) the clause of this contract entitled "Utilization of Small Business Concerns and Small Disadvantaged Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.

20. FAR 52.219-13 UTILIZATION OF WOMEN-OWNED SMALL BUSINESSES *(APR 1984)*

(a) "Women-owned small businesses," as used in this clause, means businesses that are at least 51 percent owned by women who are United States citizens and who also control and operate the business.

"Control," as used in this clause, means exercising the power to make policy decisions.

"Operate," as used in this clause, means being actively involved in the day-to-day management of the business.

(b) It is the policy of the United States that women-owned small businesses shall have the maximum practicable opportunity to participate in performing contracts awarded by any Federal agency.

(c) The Contractor agrees to use its best efforts to give women-owned small businesses the maximum practicable opportunity to participate in the subcontracts it awards to the fullest extent consistent with the efficient performance of its contract.

21. FAR 52.220-3 UTILIZATION OF LABOR SURPLUS AREA CONCERNS *(APR 1984)*

(a) **Applicability.** This clause is applicable if this contract exceeds the appropriate small purchase limitation in Part 13 of the Federal Acquisition Regulation.

(b) **Policy.** It is the policy of the Government to award contracts to concerns that agree to perform substantially in labor surplus areas (LSA's) when this can be done consistent with the efficient performance of the contract and at prices no higher than are obtainable elsewhere. The Contractor agrees to use its best efforts to place subcontracts in accordance with this policy.

(c) **Order of preference.** In complying with paragraph (b) above and with paragraph (c) of the clause of this contract entitled Utilization of Small Business Concerns and Small Disadvantaged Business Concerns, the Contractor shall observe the following order of preference in awarding subcontracts:

(1) small business concerns that are LSA concerns,
(2) other small business concerns, and
(3) other LSA concerns.

(d) **Definitions.** "Labor surplus area," as used in this clause, means a geographical area identified by the Department of Labor in accordance with 20 CFR 654, Subpart A, as an area of concentrated unemployment or underemployment or an area of labor surplus.

"Labor surplus area concern," as used in this clause, means a concern that together with its first-tier subcontractors will perform substantially in labor surplus areas. Performance is substantially in labor surplus areas if the costs incurred under the contract on account of manufacturing, production, or performance of appropriate services in labor surplus areas exceed 50 percent of the contract price.

22. FAR 52.220-4 LABOR SURPLUS AREA SUBCONTRACTING PROGRAM *(APR 1984)*

NOTE: This clause applies to this contract only if the price is in excess of $500,000.

(a) See the Utilization of Labor Surplus Area Concerns clause of this contract for applicable definitions.

(b)The Contractor agrees to establish and conduct a program to encourage labor surplus area (LSA) concerns to compete for subcontracts within their capabilities when the subcontracts are consistent with the efficient performance of the contract at prices no higher than obtainable elsewhere. The contractor shall-

(1) Designate a liaison officer who will (i) maintain liaison with authorized representatives of the Government on LSA matters, (ii) supervise compliance with the Utilization of Labor Surplus Area Concerns clause, and (iii) administer the Contractor's labor surplus area subcontracting program;

(2) Provide adequate and timely consideration of the potentialities of the LSA concerns in all make-or-buy decisions;

(3) Ensure that LSA concerns have an equitable opportunity to compete for subcontracts, particularly by arranging solicitations, time for the preparation of offers, quantities, specifications, and delivery schedules so as to facilitate the participation of LSA concerns;

(4) Include the Utilization of Labor Surplus Area Concerns clause in subcontracts that offer substantial LSA subcontracting opportunities; and

(5) Maintain records showing (i) the procedures adopted and (ii) the Contractor's performance, to comply with this clause. The records will be kept available for review by the Government until the expiration of 1 year after the award of this contract, or for such longer period as may be required by any other clause of this contract or by applicable law or regulations.

(c) The Contractor further agrees to insert in any related subcontract that may exceed $500,000 and that contains the Utilization of Labor Surplus Area Concerns clause, terms that conform substanially to the language of this clause, including this paragraph (c), and to notify the Contracting Officer of the names of subcontractors.

23. FAR 52.222-1 NOTICE TO THE GOVERNMENT OF LABOR DISPUTES *(APR 1984)*

(a) If the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the Contractor shall immediately give notice, including all relevant information, to the Contracting Officer.

(b) The Contractor agrees to insert the substance of this clause, including this paragraph (b), in any subcontract to which a labor dispute may delay the timely performance of this contract, except that each subcontract shall provide that in the event its timely performance is delayed or threatened by delay by any actual or potential labor dispute, the subcontractor shall immediately notify the next higher tier subcontractor or the prime Contractor, as the case may be, of all relevant information concerning the dispute.

24. FAR 52.222-3 CONVICT LABOR *(APR 1984)*

The Contractor agrees not to employ any person undergoing sentence of imprisonment in performing this contract except as provided by 18 U.S.C. 4082(c)(2) and Executive Order 11755, December 29, 1973.

25. FAR 52.222-6 CONSTRUCTION STANDARDS-FPR TEMPORARY REGULATION NO. 70 (JUN 1983)

(A) DAVIS-BACON ACT (4O U.S.C. 276a-276a-7)

(a) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of I937 or under the Housing Act of I949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (d) of this clause; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in the clause entitled "Apprentices and Trainees." Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided*, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (b) of this clause) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(b)(l) The Contracting Officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria has been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 2O2IO. The Administrator of the Wage and Hour Division, or an authorized representative, will approve, modify, or disapprove every additional classification action within 3O days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 3O-day period that additional time is necessary.

(3) In the event the Contractor, the laborers or mechanics to he employed in the classification or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator for determination. The Administrator of the Wage and Hour Division, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 3O-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (b)(2) or (b)(3) of this clause, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(c) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(d) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program. *Provided*, That the Secretary of Labor has found, upon the written request of the Contractor, that applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(e) Paragraphs (a) through (d) of the clause shall appiy to this contract to the extent that it is (l) a prime contract with the Government subject to the Davis-Bacon Act, or (2) a subcontract also subject to the Davis-Bacon Act under such price contract.

(B) CONTRACT WORK HOURS AND SAFETY STANDARDS ACT - OVERTIME COMPENSATION (4O U.S.C. 327-333)

This contract is subject to the Contract Work Hours and Safety Standards Act and to the applicable rules, regulations, and interpretations of the Secretary of Labor.

(a) **Overtime requirements.** No Contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of 8 hours in any calendar day or in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 8 hours in any calendar day or in excess of forty hours in such workweek, whichever is greater.

(b) **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the provisions set forth in paragraph (a) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the provisions set forth in paragraph (a) of this clause, in the sum of $I0 for each calendar day for which such individual was required or permitted to work in excess of 8 hours or in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in paragraph (a) of this clause.

(c) **Withholding for unpaid wages and liquidated damages**

The Contracting Officer shall upon his/her own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same Prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same Prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in paragraph (a) of this clause.

(d) **Subcontracts.** The Contractor or subcontractor shall insert in any subcontracts the provisions set forth in paragraphs (a) through (d) of this clause and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the provision set forth in paragraphs (a) through (d) of this clause.

(C) APPRENTICES AND TRAINEES

(a) **Apprentices.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 9O days of probationary

employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(b) **Trainees.** Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination of the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(c) **Equal employment opportunity.** The utilization of apprentices, trainess and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

(D) PAYROLLS AND BASIC RECORDS

(a) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of 3 years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section l(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under paragraph (d) of the clause entitled "Davis-Bacon Act" that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section l(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writng to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(b)(l) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the Contracting Officer. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under paragraph (a) of this clause. The information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents, Government Printing Office. The Contractor is responsible for the submission of copies of payrolls by all subcontractors.

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be maintained under of paragraph (a) of this clause entitled "Payrolls and Basic Records" and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR Part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or case equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (b)(2) of this clause.

(4) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title l8 and Section 23l of Title 3l of the United States Code.

(c) The contractor or subcontractor shall make the records required under paragraph (a) of this clause available for inspection, copying, or transcription by the Contracting Officer or the Department of Labor or their authorized representatives. The Contractor and subcontractors shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(E) COMPLIANCE WITH COPELAND ACT REQUIREMENT

The Contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

(F) WITHHOLDING

The Contracting Officer shall upon his/her own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same Prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevail-

ing wage requirements which is held by the same Prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the Contracting Officer may, after written notice to the Prime Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(G) SUBCONTRACTS

The Contractor or subcontractor shall insert in any subcontracts the clauses entitled "Davis-Bacon Act," "Contract Work Hours and Safety Standards Act- Overtime Compensation," "Apprentices and Trainees," "Payrolls and Basic Records," "Compliance with Copeland Act Requirements," "Withholding," "Subcontracts," "Contract Termination-Debarment," "Disputes Concerning Labor Standards," "Compliance With Davis-Bacon and Related Act Requirements," and "Certification of Eligibility," and such other clauses as the Contracting Officer may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with all the contract clauses cited above.

(H) CONTRACT TERMINATION; DEBARMENT

A breach of the contract clauses entitled "Davis-Bacon Act," "Contract Work Hours and Safety Standards Act-Overtime Compensation," "Apprentices and Trainees," "Payrolls and Basic Records," "Compliance with Copeland Act Requirements," "Subcontracts," "Compliance with Davis-Bacon and Related Act Requirements," and "Certification of Eligibility," may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(I) DISPUTES CONCERNING LABOR STANDARDS

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6 and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(J) COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REQUIREMENTS

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

(K) CERTIFICATION OF ELIGIBILITY

(a) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(b) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(c) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

26. FAR 52.222-26 EQUAL OPPORTUNITY *(APR 1984)*

(a) If, during any 12-month period (including the 12 months preceding the award of this contract), the Contractor has been or is awarded nonexempt Federal contracts and/or subcontracts that have an aggregate value in excess of $10,000, the Contractor shall comply with subparagraphs (b)(1) through (11) below. Upon request, the Contractor shall provide information necessary to determine the applicability of this clause.

(b) During performing this contract, the Contractor agrees as follows:

(1) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

(2) The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (i) employment, (ii) upgrading, (iii) demotion, (iv) transfer, (v) recruitment or recruitment advertising, (vi) layoff or termination, (vii) rates of pay or other forms of compensation, and (viii) selection for training, including apprenticeship.

(3) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

(4) The Contractor shall, in all solicitations or advertisement for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(5) The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

(6) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

(7) The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. Standard Form 100 (EEO-1), or any successor form, is the prescribed form to be filed within 30 days following the award, unless filed within 12 months preceding the date of award.

(8) The Contractor shall permit access to its books, records, and accounts by the contracting agency or the Office of Federal Contract Compliance Programs (OFCCP) for the purposes of investigation to ascertain the Contractor's compliance with the applicable rules, regulations, and orders.

(9) If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.

(10) The Contractor shall include the terms and conditions of subparagraphs (b)(1) through (11) of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

(11) The Contractor shall take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing these terms and conditions, including sanctions for noncompliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of any direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

(c) Notwithstanding any other clause in this contract, disputes relative to this clause will be governed by the procedures in 41 CFR 60-1.1.

27. FAR 52.222-27 AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION *(APR 1984)*

(a) Definitions.

"Covered area," as used in this clause, means the geographical area described in the solicitation for this contract.

"Director," as used in this clause, means Director, Office of Federal Contract Compliance Programs (OFCCP), United States Department of Labor, or any person to whom the Director delegates authority.

"Employer indentification number," as used in this clause, means the Federal Social Security number used on the employer's quarterly federal tax return, U.S. Treasury Department Form 941.

"Minority," as used in this clause, means-

(1) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

(2) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

(3) Black (all persons having origins in any of the black African racial groups not of Hispanic origin);

(4) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race);

(b) If the Contractor, or a subcontractor at any tier, subcontracts a portion of the work involving any construction trade, each such subcontract in excess of $10,000 shall include this clause and the Notice containing the goals for minority and female participation stated in the solicitation for this contract.

(c) If the Contractor is participating in a Hometown Plan (41 CFR 60-4) approved by the U.S. Department of Labor in a covered area, either individually or through an association, its affirmative action obligations on all work in the plan area (including goals) shall comply with the plan for those trades that have unions participating in the plan. Contractors must be able to demonstrate participation in, and compliance with, the provisions of the plan. Each Contractor or subcontractor participating in an approved plan is also required to comply with its obligations under the Equal Opportunity clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good-faith performance by other Contractors or subcontractors toward a goal in an approved plan does not excuse any Contractor's or subcontractor's failure to make good-faith efforts to achieve the plan's goals.

(d) The Contractor shall implement the affirmative action procedures in subparagraphs (g)(1) through (16) of this clause. The goals stated in the solicitation for this contract are expressed as percentages of the total hours of employment and training of minority and female utilization that the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for the geographical area where that work is actually performed. The Contractor is expected to make substantially uniform progress toward its goals in each craft.

(e) Neither the terms and conditions of any collective bargaining agreement, nor the failure by a union with which the Contractor has a collective bargaining agreement, to refer minorities or women shall excuse the Contractor's obligations under this clause, Executive Order 11246, as amended, or the regulations thereunder.

(f) In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

(g) The Contractor shall take affirmative action to ensure equal employment opportunity. The evaluation of the Contractor's compliance with this clause shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and implement affirmative action steps at least as extensive as the following:

(1) Ensure a working environment free of harassment, intimidation, and coercion at all sites and in all facilities where the Contractor's employees are assigned to work. The Contractor, if possible, will assign two or more women to each construction project. The Contractor shall ensure that foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at these sites or facilities.

(2) Establish and maintain a current list of sources for minority and female recruitment. Provide written notification to minority and female recruitment sources and community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

(3) Establish and maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant, referrals of minorities or females from unions, recruitment sources, or community organizations, and the action taken with respect to each individual. If an individual was sent to the union hiring hall for referral and not referred back to the Contractor by the union or, if referred back, not employed by the Contractor, this shall be documented in the file, along with whatever additional actions the Contractor may have taken.

(4) Immediately notify the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred back to the Contractor a minority or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

(5) Develop on-the-job training opportunities and/or participate in training programs for the area that expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under subparagraph (g)(2) above.

(6) Disseminate the Contractor's equal employment policy by-

(i) Providing notice of the policy to unions and to training, recruitment, and outreach programs, and requesting their cooperation in assisting the Contractor in meeting its contract obligations;

(ii) Including the policy in any policy manual and in collective bargaining agreements;

(iii) Publicizing the policy in the company newspaper, annual report, etc.;

(iv) Reviewing the policy with all management personnel and with all minority and female employees at least once a year; and

(v) Posting the policy on bulletin boards accessible to employees at each location where construction work is performed.

(7) Review, at least annually, the Contractor's equal employment policy and affirmative action obligations with all employees having responsibility for hiring, assignment, layoff, termination, or other employment decisions. Conduct review of this policy with all onsite supervisory personnel before initiating construction work at a job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

(8) Disseminate the Contractor's equal employment policy externally by including it in any advertising in the news media, specifically including minority and female news media. Provide written notification to, and discuss this policy with, other Contractors and subcontractors with which the Contractor does or anticipates doing business.

(9) Direct recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students, and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than 1 month before the date for acceptance of applications for apprenticeship or training by any recruitment source, send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

(10) Encourage present minority and female employees to recruit minority persons and women. Where reasonable, provide after-school, summer, and vacation employment to minority and female youth both on the site and in other areas of the Contractor's workforce.

(11) Validate all tests and other selection requirements where required under 41 CFR 60-3.

(12) Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities. Encourage these employees to seek or to prepare for, through appropriate training, etc., opportunities for promotion.

(13) Ensure that seniority practices job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment-related activities to ensure that the Contractor's obligations under this contract are being carried out.

(14) Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

(15) Maintain a record of solicitations for subcontracts for minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

(16) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's equal employment policy and affirmative action obligations.

(h) The Contractor is encouraged to participate in voluntary associations that may assist in fulfilling one or more of the affirmative action obligations contained in subparagraphs (g)(1) through (16). The efforts of a contractor association, joint contractor-union, contractor-community, or similar group of which the contractor is a member and participant may be asserted as fulfilling one or more of its obligations under subparagraphs (g)(1) through (16), provided the Contractor-

(1) Actively participates in the group;

(2) Makes every effort to ensure that the group has a positive impact on the employment of minorities and women in the industry;

(3) Ensures that concrete benefits of the program are reflected in the Contractor's minority and female workforce participation;

(4) Makes a good-faith effort to meet its individual goals and timetables; and

(5) Can provide access to documentation that demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply is the Contractor's, and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

(i) A single goal for minorities and a separate single goal for women shall be established. The Contractor is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and nonminority. Consequently, the Contractor may be in violation of Executive Order 11246, as amended, if a particular group is employed in a substantially disparate manner.

(j) The Contractor shall not use goals or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

(k) The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts under Executive Order 11246, as amended.

(l) The Contractor shall carry out such sanctions and penalties for violation of this clause and of the Equal Opportunity clause, including suspension, termination, and cancellation of existing subcontracts, as may be imposed or ordered under Executive Order 11246, as amended, and its implementing regulations, by the OFCCP. Any failure to carry out these sanctions and penalties as ordered shall be a violation of this clause and Executive Order 11246, as amended.

(m) The Contractor in fulfilling its obligations under this clause shall implement affirmative action procedures at least as extensive as those prescribed in paragraph (g) above, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of Executive Order 11246, as amended, the implementing regulations, or this clause, the Director shall take action as prescribed in 41 CFR 60-4.8.

(n) The Contractor shall designate a responsible official to-

(1) Monitor all employment-related activity to ensure that the Contractor's equal employment policy is being carried out;

(2) Submit reports as may be required by the Government; and

(3) Keep records that shall at least include for each employee the name, address, telephone number, construction trade, union affiliation (if any), employee identification number, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, separate records are not required to be maintained.

(o) Nothing contained herein shall be construed as a limitation upon the application of other laws that establish different standards of compliance or upon the requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

28. FAR 52.222-26 EQUAL OPPORTUNITY PREAWARD CLEARANCE OF SUBCONTRACTS *(APR 1984)*

NOTE: This clause applies to this contract only if the price is at least $1,000,000.

Notwithstanding the clause of this contract entitled "Subcontractors," the Contractor shall not enter into a first-tier subcontract for an estimated or actual amount of $1 million or more without obtaining in writing from the Contracting Officer a clearance that the proposed subcontractor is in compliance with equal opportunity requirements and therefore is eligible for award.

29. FAR 52.222-35 AFFIRMATIVE ACTION FOR SPECIAL DISABLED AND VIETNAM ERA VETERANS *(APR 1984)*

(a) Definitions.

"Appropriate office of the State employment service system," as used in this clause, means the local office of the Federal-State national system of public employment offices assigned to serve the area where the employment opening is to be filled, including the District of Columbia, Guam, Puerto Rico, Virgin Islands, American Samoa, and the Trust Territory of the Pacific Islands.

"Openings that the Contractor proposes to fill from within its own organization," as used in this clause, means employment openings for which no one outside the Contractor's organization (including any affiliates, subsidiaries, and the parent companies) will be considered and includes any openings that the Contractor proposes to fill from regularly established "recall" lists.

"Openings that the Contractor proposes to fill under a customary and traditional employer-union hiring arrangement," as used in this clause, means employment openings that the Contractor proposes to fill from union halls, under their customary and traditional employer-union hiring relationship.

"Suitable employment openings," as used in this clause-

(1) Includes, but is not limited to, openings that occur in jobs categorized as-

(i) Production and nonproduction;

(ii) Plant and office;

(iii) Laborers and mechanics;

(iv) Supervisory and nonsupervisory;

(v) Technical; and

(vi) Executive, administrative, and professional positions compensated on a salary basis of less than $25,000 a year; and

(2) Includes full-time employment, temporary employment of over 3 days, and part-time employment, but not openings that the Contractor proposes to fill from within its own organization or under a customary and traditional employer-union hiring arrangement, nor openings in an educational institution that are restricted to students of that institution.

(b) General

(1) Regarding any position for which the employee for employment is qualified, the Contractor shall not discriminate against the individual because the individual is a special disabled or Vietnam Era veteran. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified special disabled and Vietnam Era veterans without discrimination based upon their disability or veterans' status in all employment practices such as-

(i) Employment;

(ii) Upgrading;

(iii) Demotion or transfer;

(iv) Recruitment;

(v) Advertising;

(vi) Layoff or termination;

(vii) Rates of pay or other forms of compensation; and

(viii) Selection for training, including apprenticeship.

(2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Vietnam Era Veterans' Readjustment Assistance Act of 1972 (the Act), as amended.

(c) Listing openings.

(1) The Contractor agrees to list all suitable employment openings existing at contract award or occurring during contract performance, at an appropriate office of the State employment service system in the locality where the opening occurs. These openings include those occurring at any Contractor facility, including one not connected with performing this contract. An independent corporate affiliate is exempt from this requirement.

(2) State and local government agencies holding Federal contracts of $10,000 or more shall also list all their suitable openings with the appropriate office of the State employment service.

(3) The listing of suitable employment openings with the State employment service system is required at least concurrently with using any other recruitment source or effort and involves the obligations of placing a bona fide job order, including accepting referrals of veterans

and nonveterans. This listing does not require hiring any particular job applicant or hiring from any particular group of job applicants and is not intended to relieve the Contractor from any requirements of Executive orders or regulations concerning nondiscrimination in employment.

(4) Whenever the Contractor becomes contractually bound to the listing terms of this clause, it shall advise the State employment service system, in each State where it has establishments, of the name and location of each hiring location in the State. As long as the Contractor is contractually bound to these terms and has so advised the State system, it need not advise the State system of subsequent contracts. The Contractor may advise the State system when it is no longer bound by this contract clause.

(5) Under the most compelling circumstances, an employment opening may not be suitable for listing, including situations when (i) the Government's needs cannot reasonably be supplied, (ii) listing would be contrary to national security, or (iii) the requirement of listing would not be in the Government's interest.

(d) **Applicability.**

(1) This clause does not apply to the listing of employment openings which occur and are filled outside the 50 states, the District of Columbia, Puerto Rico, Guam, Virgin Islands, American Samoa, and the Trust Territory of the Pacific Islands.

(2) The terms of paragraph (c) above of this clause do not apply to openings that the Contractor proposes to fill from within its own organization or under a customary and traditional employer-union hiring arrangement. This exclusion does not apply to a particular opening once an employer decides to consider applicants outside of its own organization or employer-union arrangement for that opening.

(e) **Postings.**

(1) The Contractor agrees to post employment notices stating (i) the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified special disabled veterans and veterans of the Vietnam era, and (ii) the rights of applicants and employees.

(2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. They shall be in a form prescribed by the Director, Office of Federal Contract Compliance Programs, Department of Labor (Director), and provided by or through the Contracting Officer.

(3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of the Act, and is committed to take affirmative action to employ, and advance in employment, qualified special disabled and Vietnam Era veterans.

(f) **Noncompliance.**

If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.

(g) **Subcontracts.**

The Contractor shall include the terms of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Director to enforce the terms, including action for noncompliance.

30. FAR 52.222-36 AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS *(APR 1984)*

(a) **General.**

(1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against any employee or applicant because of physical or mental handicap. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices such as-

(i) Employment;
(ii) Upgrading;
(iii) Demotion or transfer;
(iv) Recruitment;
(v) Advertising;
(vi) Layoff or termination;
(vii) Rates of pay or other forms of compensation; and
(viii) Selection for training, including apprenticeship.

(2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Rehabilitation Act of 1973 (29 U.S.C. 793) (the Act), as amended.

(b) **Postings.**

(1) The Contractor agrees to post employment notices stating (i) the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified handicapped individuals and (ii) the rights of applicants and employees.

(2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. They shall be in a form prescribed by the Director, Office of Federal Contract Compliance Programs, Department of Labor (Director), and provided by or through the Contracting Officer.

(3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 503 of the Act and is committed to take affirmative action to employ, and advance in employment, qualified physically and mentally handicapped individuals.

(c) **Noncompliance.**

If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.

(d) **Subcontracts.**

The Contractor shall include the terms of this clause in every subcontract or purchase order in excess of $2,500 unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Director to enforce the terms, including action for noncompliance.

31. FAR 52.223-2 CLEAN AIR AND WATER *(APR 1984)*

NOTE: This clause applies to this contract only if the estimated cost, together with any fixed fee, is (a) in excess of $100,000; (b) a facility to be used has been the subject of a conviction under the applicable portion of the Air Act (42 U.S.C. 7413(c)(1)) or the Water Act (33 U.S.C. 1319(c)) and is listed by EPA as a violating facility; or (c) the acquisition is not exempt under FAR 23.104.

(a) "Air Act," as used in this clause, means the Clean Air Act (42 U.S.C. 7401 et seq.).

"Clean air standards," as used in this clause, means-

(1) Any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, work practices, or other requirements contained in, issued under, or otherwise adopted under the Air Act or Executive Order 11738;

(2) An applicable implementation plan as described in section 110(d) of the Air Act (42 U.S.C. 7410(d));

(3) An approved implementation procedure or plan under section 111(c) or section 111(d) of the Air Act (42 U.S.C. 7411(c) or (d)); or

(4) An approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 7412(d)).

"Clean water standards," as used in this clause, means any enforceable limitation, control, condition, prohibition, standard, or other requirement promulgated under the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by local government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317).

"Compliance," as used in this clause, means compliance with-

(1) Clean air or water standards; or

(2) A schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency, or an air or water pollution control agency under the requirements of the Air Act or Water Act and related regulations.

"Facility," as used in this clause, means any building, plant, installation, structure, mine, vessel or other floating craft, location, or site of operations, owned, leased, or supervised by a Contractor or subcontractor, used in the performance of a contract or subcontract. Where a location or site of operations includes more than one building, plant,

installation, or structure, the entire location or site shall be deemed a facility except when the Administrator, or a designee, of the Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.

"Water Act," as used in this clause, means Clean Water Act (33 U.S.C. 1251 et seq.).

(b) The Contractor agrees-

(1) To comply with all the requirements of section 114 of the Clean Air Act (42 U.S.C. 7414) and section 308 of the Clean Water Act (33 U.S.C. 1318) relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, and all regulations and guidelines issued to implement those acts before the award of this contract;

(2) That no portion of the work required by this prime contract will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date when this contract was awarded unless and until the EPA eliminates the name of the facility from the listing;

(3) To use best efforts to comply with clean air standards and clean water standards at the facility in which the contract is being performed; and

(4) To insert the substance of this clause into any nonexempt subcontract, including this subparagraph (b)(4).

32. FAR 52.225-5 BUY AMERICAN ACT-CONSTRUCTION MATERIALS *(APR 1984)*

(a) The Buy American Act (41 U.S.C. 10) provides that the Government give preference to domestic construction material.

"Components," as used in this clause, means those articles, materials, and supplies incorporated directly into construction materials.

"Construction materials," as used in this clause, means articles, materials, and supplies brought to the construction site for incorporation into the building or work.

"Domestic construction material," as used in this clause, means (1) an unmanufactured construction material mined or produced in the United States, or (2) a construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind as the construction materials determined to be unavailable pursuant to subparagraph 25.202(a)(3) of the Federal Acquisition Regulation (FAR) shall be treated as domestic.

(b) The Contractor agrees that only domestic construction material will be used by the Contractor, subcontractors, materialmen, and suppliers in the performance of this contract, except for foreign construction materials, if any, listed in this contract.

(The foregoing requirements are administered in accordance with Executive Order No. 10582, dated December 17, 1954, as amended, and Subpart 25.2 of the FAR).

33. FAR 52.228-2 ADDITIONAL BOND SECURITY *(APR 1984)*

The Contractor shall promptly furnish additional security required to protect the Government and persons supplying labor or materials under this contract if-

(a) Any surety upon any bond furnished with this contract becomes unacceptable to the Government;

(b) Any surety fails to furnish reports on its financial condition as required by the Government; or

(c) The contract price is increased so that the penal sum of any bond becomes inadequate in the opinion of the Contracting Officer.

34. FAR 52.228-5 INSURANCE-WORK ON A GOVERNMENT INSTALLATION *(APR 1984)*

NOTE: This clause applies to this contract if any work contemplated by this contract is performed on a Federal government installation.

(a) The Contractor shall, at its own expense, provide and maintain during the entire performance period of this contract at least the kinds and minimum amounts of insurance required in the Schedule or elsewhere in the contract.

(b) Before commencing work under this contract, the Contractor shall certify to the Contracting Officer in writing that the required insurance has been obtained. The policies evidencing required insurance shall contain an endorsement to the effect that any cancellation or any material change adversely affecting the Government's interest shall not be effective (1) for such period as the laws of the State in which this contract is to be performed prescribe or (2) until 30 days after the insurer or the Contractor gives written notice to the Contracting Officer, whichever period is longer.

(c) The Contractor shall insert the substance of this clause, including this paragraph (c), in subcontracts under this contract that require work on a Government installation and shall require subcontractors to provide and maintain the insurance required in the Schedule or elsewhere in the contract. At least 5 days before entry of each such subcontractor's personnel on the Government installation, the Contractor shall furnish (or ensure that there has been furnished) to the Contracting Officer a current certificate of insurance, meeting the requirements of paragraph (b) above, for each such subcontractor.

35. FAR 52.229-3 FEDERAL, STATE, AND LOCAL TAXES *(APR 1984)*

(a) "Contract date," as used in this clause, means the date set for bid opening or, if this is a negotiated contract or a modification, the effective date of this contract or modification.

"All applicable Federal, State, and local taxes and duties," as used in this clause, means all taxes and duties, in effect on the contract date, that the taxing authority is imposing and collecting on the transactions or property covered by this contract.

"After-imposed Federal tax," as used in this clause, means any new or increased Federal excise tax or duty, or tax that was exempted or excluded on the contract date but whose exemption was later revoked or reduced during the contract period, on the transactions or property covered by this contract that the Contractor is required to pay or bear as the result of legislative, judicial, or administrative action taking effect after the contract date. It does not include social security tax or other employment taxes.

"After-relieved Federal tax," as used in this clause, means any amount of Federal excise tax or duty, except social security or other employment taxes, that would otherwise have been payable on the transactions or property covered by this contract, but which the Contractor is not required to pay or bear, or for which the Contractor obtains a refund or drawback, as the result of legislative, judicial, or administrative action taking effect after the contract date.

(b) The contract price includes all applicable Federal, State, and local taxes and duties.

(c) The contract price shall be increased by the amount of any after-imposed Federal tax, provided the Contractor warrants in writing that no amount for such newly imposed Federal excise tax or duty or rate increase was included in the contract price, as a contingency reserve or otherwise.

(d) The contract price shall be decreased by the amount of any after-relieved Federal tax.

(e) The contract price shall be decreased by the amount of any Federal excise tax or duty, except social security or other employment taxes, that the Contractor is required to pay or bear, or does not obtain a refund of, through the Contractor's fault, negligence, or failure to follow instructions of the Contracting Officer.

(f) No adjustment shall be made in the contract price under this clause unless the amount of the adjustment exceeds $100.

(g) The Contractor shall promptly notify the Contracting Officer of all matters relating to any Federal excise tax or duty that reasonably may be expected to result in either an increase or decrease in the contract price and shall take appropriate action as the Contracting Officer directs.

(h) The Government shall, without liability, furnish evidence appropriate to establish exemption from any Federal, State, or local tax when the Contractor requests such evidence and a reasonable basis exists to sustain the exemption.

36. FAR 52.229-5 TAXES-CONTRACTS PERFORMED IN U.S. POSSESSIONS OR PUERTO RICO *(APR 1984)*

The term "local taxes," as used in the Federal, State, and local taxes clause of this contract, includes taxes imposed by a possession of the United States or by Puerto Rico.

37. DEAR 952.232-5 PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS *(APR 1984)*

(a) The Government shall pay the Contractor the contract price as provided in this contract.

(b) The Government shall make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates approved by the Contracting Officer. If requested by the Contracting Officer, the Contractor shall furnish a breakdown of the total contract price showing the amount included therein for each principal category of the work, in such detail as requested, to provide a basis for determining progress payments. In the preparation of estimates the Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site may also be taken into consideration if;

(1) Consideration is specifically authorized by this contract; and

(2) The Contractor furnishes satisfactory evidence that it has acquired title to such material and that the material will be used to perform this contract.

(c) In making these progress payments, there shall be retained 10 percent of the estimated amount until final completion and acceptance of the contract work. However, if the Contracting Officer finds that satisfactory progress was achieved during any period for which a progress payment is to be made, the Contracting Officer may authorize payment to be made in full without retention of a percentage. When the work is substantially complete, the Contracting Officer shall retain an amount that the Contracting Officer considers adequate protection of the Government and may release to the Contractor all or a portion of any excess amount. Also, on completion and acceptance of each separate building, public work, or other division of the contract, for which the price is stated separately in the contract, payment may be made for the completed work without retention of a percentage.

(d) All material and work covered by progress payments made shall, at the time of payment, become the sole property of the Government, but this shall not be construed as-

(1) Relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or

(2) Waiving the right of the Government to require the fulfillment of all of the terms of the contract.

(e) The Government shall, after receipt of a proper invoice, reimburse the Contractor for the entire amount of premiums paid for performance and payment bonds (including coinsurance and reinsurance agreements, when applicable) after furnishing evidence of full payment to the surety.

(f) The Government shall pay the amount due the Contractor under this contract after—

(1) Completion and acceptance of all work;

(2) Presentation of a properly executed voucher; and

(3) Presentation of release of all claims against the Government arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned under the Assignment of Claims Act of 1940 (31 U.S.C. 203 and 41 U.S.C. 15).

38. FAR 52.232-17 INTEREST *(APR 1984)*

(a) Notwithstanding any other clause of this contract, all amounts that become payable by the Contractor to the Government under this contract (net of any applicable tax credit under the Internal Revenue Code (26 U.S.C. 1481)) shall bear simple interest from the date due until paid unless paid within 30 days of becoming due. The interest rate shall be the interest rate established by the Secretary of the Treasury as provided in Section 12 of the Contract Disputes Act of 1978 (Public Law 95-563), which is applicable to the period in which the amount becomes due, as provided in paragraph (b) of this clause, and then at the rate applicable for each six-month period as fixed by the Secretary until the amount is paid.

(b) Amounts shall be due at the earliest of the following dates:

(1) The date fixed under this contract.

(2) The date of the first written demand for payment consistent with this contract, including any demand resulting from a default termination.

(3) The date the Government transmits to the Contractor a proposed supplemental agreement to confirm completed negotiations establishing the amount of debt.

(4) If this contract provides for revision of prices, the date of written notice to the Contractor stating the amount of refund payable in connection with a pricing proposal or a negotiated pricing agreement not confirmed by contract modification.

(c) The interest charge made under this clause may be reduced under the procedures prescribed in 32.614-2 of the Federal Acquisition Regulation in effect on the date of this contract.

39. FAR 52.232-23 ASSIGNMENT OF CLAIMS *(APR 1984)*

(a) The Contractor, under the Assignment of Claims Act, as amended, 31 U.S.C. 203, 41 U.S.C. 15 (hereafter referred to as the "the Act"), may assign its rights to be paid amounts due or to become due as a result of the performance of this contract to a bank, trust company, or other financing institution, including any Federal lending agency. The assignee under such an assignment may thereafter further assign or reassign its right under the original assignment to any type of financing institution described in the preceding sentence.

(b) Any assignment or reassignment authorized under the Act and this clause shall cover all unpaid amounts payable under this contract, and shall not be made to more than one party, except that an assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in the financing of this contract.

(c) The Contractor shall not furnish or disclose to any assignee under this contract any classified document (including this contract) or information related to work under this contract until the Contracting Officer authorizes such action in writing.

40. DEAR 952.232-70 PAYMENT DUE DATES, INVOICE REQUIREMENTS AND PENALTIES-ALTERNATE II *(APR 1984)*

(a) Nothwithstanding the payment provisions stated elsewhere in this contract, payment due dates, invoice requirements and penalties for overdue payments, if any, shall be determined under this contract as provided herein.

(b) Payments for complete delivered property, services or work accepted under this contract shall be due on the 30th calendar day unless otherwise specified in this contract after the later of the date the property, services or work were accepted by the Government; the date of actual receipt of a proper invoice by the by the Government office designated in this contract for invoice receipt; or where applicable, the date the contractor's release of claims in received by the contracting officer. Payment for reimbursement of premiums paid by the contractor for performance and payment bonds shall be due *(See Section H of this contract)* calendar days after the date of actual receipt of a proper invoice in the Government designated office or the date satisfactory evidence of full payment to the surety is received by

(c) For purposes of determining payment due dates and for no other purpose, the Government agrees to inspect and determine the acceptability of items delivered under the terms of this contract *(See Section H of this contract)* calendar days after the date of receipt or completion of work. If actual acceptance occurs later, constructive acceptance will be deemed to occur on the last day of the above stated inspection period.

(d) If a delivered item or completed work is rejected for failure to conform to the technical requirements of the contract, or for damage in transit or otherwise, the provisions of paragraph (c) will apply to the replacement item(s) delivered or be reapplied upon Contractor correction of the defect(s).

(e) Progress payments, if provided, shall be due on the *(See Section H of this contract)* calendar day after the date of receipt of each progress payment request by the Government office designated for invoice receipt.

(f) Proper invoices shall be submitted in an original and *(See Section H of this contract)* copies to the Government office designated in this contract, and shall include the Contractor's name and invoice date; contract or order number; payment terms; other documentation or information as required by the contract; name (where practicable), title, phone number, office name and complete mailing address of the responsible official to whom payment may be made. Proper invoices for completed supplies, services or work shall also include the description, price and quantity of item(s) actually delivered or services rendered; and, if applicable, shipping terms.

(g) For complete delivered supplies, services or work, the Government shall pay an interest penalty when the payment check or electronic funds transfer is dated more than fifteen (15) calendar days after the payment due date as established by the provisions herein provided such delays are not due to contractor failure to provide proper

payee designations in accordance with the requirements stated elsewhere in this contract; or a discount is taken after expiration of the discount period and the underpayment is not corrected within fifteen (15) calendar days of the expired period.

(h) Interest penalties due under the provisions of this clause shall be calculated in accordance with the provisions of the Prompt Payment Act (31 U.S.C. 3901 et seq.); based on the interest rate(s) established by the Secretary of the Treasury under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611). Claims for failure to pay interest penalties may be filed under Section 6 of the Contract Disputes Act of 1978 (41 U.S.C. 6O5). Interest penalties under this clause shall not accrue for more than one year or after the timely filing of a claim for such penalties under the Contract Disputes Act.

(i) Claims concerning disputes, and any interest which may be payable with respect to the period while such dispute is being resolved, shall be subject to the provisions specified in the Disputes clause of this contract.

(j) Interest penalities shall not apply when the contractor is notified that an invoice is defective or improper provided the Contractor is notified within fifteen (15) calendar days after actual invoice receipt or acceptance of delivered contract item, whichever is later, that payment is delayed because of a disagreement between the Government and the Contractor concerning contract compliance or amounts invoiced, or the penalty amounts to less than one dollar; nor are they required when payments are made for progress payment purposes, payments are made in advance, or for a period when amounts are withheld temporarily in accordance with the contract. In the event the Government fails to provide notification of a defective invoice within fifteen (15) calendar days, the due date for the corrected invoice will be the normal payment due date less the difference between the fifteenth (15) calendar day and the day notification was made. the contracting officer, whichever is later.

41. DEAR 952.232-73 PAYMENTS METHODS *(APR 1984)*

(a) Payments due for amounts properly invoiced in accordance with the terms and conditions specified elsewhere in the contract shall be made either by Treasury check(s) payable to the contractor or designee or by electronic funds transfer(s) to a financial institution designated by the contractor for that purpose. The method of payment shall be determined by the Government at the time of payment in accordance with applicable Treasury Department requirements.

(b) After award but no later than fourteen (14) days before an invoice or bill is submitted for payment, the contractor shall designate a financial institution for the receipt of electronic funds transfer payments hereunder; and provide the appropriate Government representative (contracting officer or finance official as determined by the Government) with the name of the designated financial institution, financial institution's or correspondent financial institution's 9-digit American Bankers Association identifying number, telegraphic abbreviation of such financial institution, and account number at the designated financial institution to be credited with funds.

(c) In the event the contractor during the performance of this contract elects to designate a different financial institution for the receipt of any payment made using electronic funds transfer procedures, notification of such change and the information as specified in paragraph (b) above must be received by the appropriate Government representative thirty (30) days prior to the date such change is to become effective.

(d) The document furnishing the information required in paragraphs (b) and (c) above must be dated and contain the signature, title, and telephone number of the contractor official authorized to provide it, as well as the contractor's name and contract number.

(e) Contractor failure to properly designate a financial institution or to provide appropriate payee bank account information may delav payments of amounts otherwise properly due.

42. FAR 52.233-1 DISPUTES-ALTERNATE I *(APR 1984)*

(a) This contract is subject to the Contract Disputes Act of 1978 (41 U.S.C. 601-613) (the Act).

(b) Except as provided in the Act, all disputes arising under or relating to this contract shall be resolved under this clause.

(c) "Claim," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to this contract. A claim arising under a contract, unlike a claim relating to that contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. However, a written demand or written assertion by the Contractor seeking the payment of money exceeding $50,000 is not a claim under the Act until certified as required by subparagraph (d)(2) below. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim under the Act. The submission may be converted to a claim under the Act, by complying with the submission and certification requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.

(d) (1) A claim by the Contractor shall be made in writing and submitted to the Contracting Officer for a written decision. A claim by the Government against the Contractor shall be subject to a written decision by the Contracting Officer.

(2) For Contractor claims exceeding $50,000, the Contractor shall submit with the claim a certification that-

(i) The claim is made in good faith;

(ii) Supporting data are accurate and complete to the best of the Contractor's knowledge and belief; and

(iii) The amount requested accurately reflects the contract adjustment for which the Contractor believes the Government is liable.

(3) (i) If the Contractor is an individual, the certification shall be executed by that individual.

(ii) If the Contractor is not an individual, the certification shall be executed by-

(A) A senior company official in charge at the Contractor's plant or location involved; or

(B) An officer or general partner of the Contractor having overall responsibility for the conduct of the Contractor's affairs.

(e) For Contractor claims of $50,000 or less, the Contracting Officer must, if requested in writing by the Contractor, render a decision within 60 days of the request. For Contractor-certified claims over $50,000, the Contracting Officer must, within 60 days, decide the claim or notify the Contractor of the date by which the decision will be made.

(f) The Contracting Officer's decision shall be final unless the Contractor appeals or files a suit as provided in the Act.

(g) The Government shall pay interest on the amount found due and unpaid from (1) the date the Contracting Officer receives the claim (properly certified if required), or (2) the date payment otherwise would be due, if that date is later, until the date of payment. Simple interest on claims shall be paid at the rate, fixed by the Secretary of the Treasury as provided in the Act, which is applicable to the period during which the Contracting Officer receives the claim and then at the rate applicable for each 6-month period as fixed by the Treasury Secretary during the pendency of the claim.

(h) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under or relating to the contract, and comply with any decision of the Contracting Officer.

43. FAR 52.236-1 PERFORMANCE OF WORK BY THE CONTRACTOR *(APR 1984)*

NOTE: This clause applies to this contract only if the price exceeds $1,000,000.

The Contractor shall perform on the site, and with its own organization, work equivalent ot at least *(See Section H of this contract)* percent of the total amount of work to be performed under the contract. This percentage may be reduced by a supplemental agreement to this contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.

44. FAR 52.236-2 DIFFERING SITE CONDITIONS *(APR 1984)*

(a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or (2) unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.

(b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, an equitable adjustment shall be made under this clause and the contract modified in writing accordingly

(c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required, provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.

(d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

45. FAR 52.236-3 SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK *(APR 1984)*

(a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Government, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the Government.

(b) The Government assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the Government. Nor does the Government assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.

46. FAR 52.236-5 MATERIAL AND WORKMANSHIP *(APR 1984)*

(a) All equipment, material, and articles incorporated into the work covered by this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.

(b) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. When directed to do so, the Contractor shall submit samples for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

(c) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may require, in writing, that the Contractor remove from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable.

47. FAR 52.236-6 SUPERINTENDENCE BY THE CONTRACTOR *(APR 1984)*

At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the work a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.

48. FAR 52.236-7 PERMITS AND RESPONSIBILITIES *(APR 1984)*

The Contractor shall, without additional expense to the Government, be responsible for obtaining any necessary licenses and permits, and for complying with any Federal, State, and municipal laws, codes, and regulations applicable to the performance of the work. The Contractor shall also be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence, and shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.

49. FAR 52.236-8 OTHER CONTRACTS *(APR 1984)*

The Government may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with Government employees and shall carefully adapt scheduling and performing the work under this contract to accommmodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by Government employees.

50. FAR 52.236-9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS *(APR 1984)*

(a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

(b) The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

51. FAR 52.236-10 OPERATIONS AND STORAGE AREAS *(APR 1984)*

(a) The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.

(b) Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

(c) The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the

work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

52. FAR 52.236-11 USE AND POSSESSION PRIOR TO COMPLETION *(APR 1984)*

(a) The Government shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the Government intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The Government's possession or use shall not be deemed an acceptance of any work under the contract.

(b) While the Government has such possession or use, the Contractor shall be relieved of the responsibility for the loss of or damage to the work resulting from the Government's possession or use, notwithstanding the terms of the clause in this contract entitled "Permits and Responsibilities." If prior possession or use by the Government delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

53. FAR 52.236-12 CLEANING UP *(APR 1984)*

The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. Before completing the work, the Contractor shall remove from the work and premises any rubbish, tools, scaffolding, equipment, and materials that are not the property of the Government. Upon completing the work, the Contractor shall leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer.

54. FAR 52.236-13 ACCIDENT PREVENTION *(APR 1984)*

(a) In performing this contract, the Contractor shall provide for protecting the lives and health of employees and other persons; preventing damage to property, materials, supplies, and equipment; and avoiding work interruptions. For these purposes, the Contractor shall-

(1) Provide appropriate safety barricades, signs, and signal lights;

(2) Comply with the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910; and

(3) Ensure that any additional measures the Contracting Officer determines to be reasonably necessary for this purpose are taken.

(b) If this contract is with any Department of Defense agency or component, the Contractor shall comply with all pertinent provisions of the U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, dated April 1981.

(c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment. The Contractor shall report this data in the manner prescribed by the Contracting Officer.

(d) The Contracting Officer shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.

(e) The Contractor shall be responsible for its subcontractors' compliance with this clause.

55. FAR 52.236-15 SCHEDULES FOR CONSTRUCTION CONTRACTS *(APR 1984)*

(a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring materials, plant, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments until the Contractor submits the required schedule.

(b) The Contractor shall enter the actual progress on the chart as directed by the Contracting Officer, and upon doing so shall immediately deliver three copies of the annotated schedule to the Contracting Officer. If, in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the Government. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.

(c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the default terms of this contract.

56. FAR 52.236-17 LAYOUT OF WORK *(APR 1984)*

The Contractor shall lay out its work from Government-established base lines and bench marks indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor or through its negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

57. FAR 52.236-21 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION *(APR 1984)*

(a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

(b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by", or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated

(c) Where "as shown", "as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place", that is "furnished and installed".

(d) Shop drawings means drawings, submitted to the Government by the Contractor, subcontractor, any lower tier subcontractor pursuant to a construction contract, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., form, fit, and attachment details) of materials of equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the contractor to explain in detail specific portions of the work required by the contract. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the Government's reasons therefor. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.

(f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Contracting Officer approves any such variation, the Contracting Officer shall issue an appropriate contract modification, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

(g) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by the Contracting Officer and one set will be returned to the Contractor.

(h) This clause shall be included in all subcontracts at any tier.

58. FAR 52.243-4 CHANGES *(APR 1984)*

(a) The Contracting Officer may, at any time, without notice to the sureties, if any, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract, including changes-

(1) In the specifications (including drawings and designs);

(2) In the method or manner of performance of the work;

(3) In the Government-furnished facilities, equipment, materials, services, or site; or

(4) Directing acceleration in the performance of the work.

(b) Any other written or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating (1) the date, circumstances, and source of the order and (2) that the Contractor regards the order as a change order.

(c) Except as provided in this clause, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for a "proposal for adjustment" (hereafter referred to as proposal) based on defective specifications, no proposal for any change under paragraph (b) above shall be allowed for any costs incurred more than 20 days before the Contractor gives written notice as required. In the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

(e) The Contractor must submit any proposal under this clause within 30 days after (1) receipt of a written change order under paragraph (a) above or (2) the furnishing of a written notice under paragraph (b) above, by submitting to the Contracting Officer a written statement describing the general nature and amount of the proposal, unless this period is extended by the Government. The statement of proposal for adjustment may be included in the notice under paragraph (b) above.

(f) No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

59. FAR 52.244-1 SUBCONTRACTS UNDER FIXED-PRICE CONTRACTS *(APR 1984)*

NOTE: This clause applies only if the price of this contract exceeds $500,000.

(a) This clause does not apply to firm-fixed-price contracts and fixed- price contracts with economic price adjustment. However, it does apply to subcontracts resulting from unpriced modifications to such contracts.

(b) "Subcontract," as used in this clause, includes but is not limited to purchase orders, and changes and modifications to purchase orders. The Contractor shall notify the Contracting Officer reasonably in advance of entering into any subcontract if the Contractor does not have an approved purchasing system and if the subcontract';

(1) Is to be a cost-reimbursement, time-and-materials, or labor-hour contract estimated to exceed $25,000 including any fee;

(2) Is proposed to exceed $100,000; or

(3) Is one of a number of subcontracts with a single subcontractor, under this contract, for the same or related supplies or services, that in the aggregate are expected to exceed $100,000.

(c) The advance notification required by paragraph (b) above shall include;

(1) A description of the supplies or services to be subcontracted;

(2) Identification of the type of subcontract to be used;

(3) Identification of the proposed subcontractor and an explanation of why and how the proposed subcontractor was selected, including the competition obtained;

(4) The proposed subcontract price and the Contractor's cost or price analysis;

(5) The subcontractor's current, complete, and accurate cost or pricing data and Certificate of Current Cost or Pricing Data, if required by other contract provisions;

(6) The subcontractor's Disclosure Statement or Certificate relating to Cost Accounting Standards when such data are required by other provisions of this contract, and

(7) A negotiation memorandum reflecting;

(i) The principal elements of the subcontract price negotiations;

(ii) The most significant considerations controlling establishment of initial or revised prices;

(iii) The reason cost or pricing data were or were not required;

(iv) The extent, if any, to which the Contractor did not rely on the subcontractor's cost or pricing data in determining the price objective and in negotiating the final price;

(v) The extent, if any, to which it was recognized in the negotiation that the subcontractor's cost or pricing data were not accurate, complete, or current; the action taken by the Contractor and subcontractor; and the effect of any such defective data on the total price negotiated;

(vi) The reasons for any significant difference between the Contractor's price objective and the price negotiated; and

(vii) A complete explanation of the incentives are used. The explanation shall identify each critical performance element, management decisions used to quantify each incentive element, reasons for the incentives, and a summary of all trade-off possibilities considered.

(d) The Contractor shall obtain the Contracting Officer's written consent before placing any subcontract for which advance notification is required under paragraph (b) above. However, the Contracting Officer may ratify in writing any such subcontract. Ratification shall constitute the consent of the Contracting Officer.

(e) Even if the Contractor's purchasing system has been approved, the Contractor shall obtain the Contracting Officer's written consent before placing subcontracts that have been selected for special surveillance and so identified in the Schedule of this contract.

(f) Unless the consent or approval specifically provides otherwise, neither consent by the Contracting Officer to any subcontract nor approval of the Contractor's purchasing system shall constitute a determination (1) of the acceptability of any subcontract terms or conditions, (2) of the acceptability of any subcontract price or of any amount paid under any subcontract, or (3) to relieve the Contractor of any responsibility for performing this contract.

(g) No subcontract placed under this contract shall provide for payment on a cost-plus-a-percentage-of-cost basis, and any fee payable under cost-reimbursement subcontracts shall not exceed the fee limitations in subsection 16.301-4 of the Federal Acquisition Regulation (FAR).

(h) The Government reserves the right to review the Contractor's purchasing system as set forth in FAR Subpart 44.3.

60. FAR 52.245-2 GOVERNMENT PROPERTY-FIXED-PRICE CONTRACTS *(APR 1984)*

(a) **Government-furnished property.**

(1) The Government shall deliver to the Contractor, for use in connection with and under the terms of this contract, the Government-furnished property described in the Schedule or specifications together with any related data and information that the Contractor may request and is reasonably required for the intended use of the property (hereinafter referred to as "Government-furnished property").

(2) The delivery or performance dates for this contract are based upon the expectation that Government-furnished property suitable for use (except for property furnished "as-is") will be delivered to the Contractor at the times stated in the Schedule or, if not so stated, in sufficient time to enable the Contractor to meet the contract's delivery or performance dates.

(3) If Government-furnished property is received by the Contractor in a condition not suitable for the intended use, the Contractor shall, upon receipt of it, notify the Contracting Officer, detailing the facts, and, as directed by the Contracting Officer and at Government expense, either repair, modify, return, or otherwise dispose of the property. After completing the directed action and upon written request of the Contractor, the Contracting Officer shall make an equitable adjustment as provided in paragraph (h) of this clause.

(4) If Government-furnished property is not delivered to the Contractor by the required time, the Contracting Officer shall, upon the Contractor's timely written request, make a determination of the delay, if any, caused the Contractor and shall make an equitable adjustment in accordance with paragraph (h) of this clause.

(b) **Changes in Government-furnished property.**

(1) The Contracting Officer may, by written notice, (i) decrease the Government-furnished property provided or to be provided under this contract, or (ii) substitute other Government-furnished property for the property to be provided by the Government, or to be acquired by the Contractor for the Government, under this contract. The Contractor shall promptly take such action as the Contracting Officer may direct regarding the removal, shipment, or disposal of the property covered by such notice.

(2) Upon the Contractor's written request, the Contracting Officer shall make an equitable adjustment to the contract in accordance with paragraph (h) of this clause, if the Government has agreed in the Schedule to make the property available for performing this contract and there is any-

(i) Decrease or substitution in this property pursuant to subparagraph (b)(1) above; or

(ii) Withdrawal of authority to use this property, if provided under any other contract or lease.

(c) **Title in Government property.**

(1) The Government shall retain title to all Government-furnished property.

(2) All Government-furnished property and all property acquired by the Contractor, title to which vests in the Government under this paragraph (collectively referred to as "Government property"), are subject to the provisions of this clause. Title to Government property shall not be affected by its incorporation into or attachment to any property not owned by the Government, nor shall Government property become a fixture or lose its identity as personal property by being attached to any real property.

(3) Title to each item of facilities, special test equipment, and special tooling (other than that subject to a special tooling clause) acquired by the Contractor for the Government under this contract shall pass to and vest in the Government when its use in performing this contract commences or when the Government has paid for it, whichever is earlier, whether or not title previously vested in the Government.

(4) If this contract contains a provision directing the Contractor to purchase material for which the Government will reimburse the Contractor as a direct item of cost under this contract-

(i) Title to material purchased from a vendor shall pass to and vest in the Government upon the vendor's delivery of such material, and

(ii) Title to all other material shall pass to and vest in the Government upon-

(A) Issuance of the material for use in contract performance;

(B) Commencement of processing of the material or its use in contract performance, or

(C) Reimbursement of the cost of the material by the Government, whichever occurs first.

(d) **Use of Government property.**

The Government property shall be used only for performing this contract, unless otherwise provided in this contract or approved by the Contracting Officer.

(e) **Property administration.**

(1) The Contractor shall be responsible and accountable for all Government property provided under this contract and shall comply with Federal Acquisition Regulation (FAR) Subpart 45.5 and DOE Acquisition Regulation Subpart 945.5, as in effect on the date of this contract.

(2) The Contractor shall establish and maintain a program for the use, maintenance, repair, protection, and preservation of Government property in accordance with sound industrial practice and the applicable provisions of Subpart 45.5 of the FAR and DOE Acquisition Regulation Subpart 945.5.

(3) If damage occurs to Government property, the risk of which has been assumed by the Government under this contract, the Government shall replace the items or the Contractor shall make such repairs as the Government directs. However, if the Contractor cannot effect such repairs within the time required, the Contractor shall dispose of the property as directed by the Contracting Officer. When any property for which the Government is responsible is replaced or repaired, the Contracting Officer shall make an equitable adjustment in accordance with paragraph (h) of this clause.

(4) The Contractor represents that the contract price does not include any amount for repairs or replacement for which the Government is responsible. Repair or replacement of property for which the Contractor is responsible shall be accomplished by the Contractor at its own expense.

(f) **Access.**

The Government and all its designees shall have access at all reasonable times to the premises in which any Government property is located for the purpose of inspecting the Government property.

(g) **Risk of loss.**

Unless otherwise provided in this contract, the Contractor assumes the risk of, and shall be responsible for, any loss or destruction of, or damage to, Government property upon its delivery to the Contractor or upon passage of title to the Government under paragraph (c) of this clause. However, the Contractor is not responsible for reasonable wear and tear to Government property or for Government property properly consumed in performing this contract.

(h) **Equitable adjustment.**

When this clause specifies an equitable adjustment, it shall be made to any affected contract provision in accordance with the procedures of the Changes clause. When appropriate, the Contracting Officer may initiate an equitable adjustment in favor of the Government. The right to an equitable adjustment shall be the Contractor's exclusive remedy. The Government shall not be liable to suit for breach of contract for-

(1) Any delay in delivery of Government-furnished property;

(2) Delivery of Government-furnished property in a condition not suitable for its intended use;

(3) A decrease in or substitution of Government-furnished property; or

(4) Failure to repair or replace Government property for which the Government is responsible.

(i) **Final accounting and disposition of Government property.**

Upon completing this contract, or at such earlier dates as may be fixed by the Contracting Officer, the Contractor shall submit, in a form acceptable to the Contracting Officer, inventory schedules covering all items of Government property (including any resulting scrap) not consumed in performing this contract or delivered to the Government. The Contractor shall prepare for shipment, deliver f.o.b. origin, or dispose of the Government property as may be directed or authorized by the Contracting Officer. The net proceeds of any such disposal shall be credited to the contract price or shall be paid to the Government as the Contracting Officer directs.

(j) **Abandonment and restoration of Contractor's premises.**

Unless otherwise provided herein, the Government-

(1) May abandon any Government property in place, at which time all obligations of the Government regarding such abandoned property shall cease; and

(2) Has no obligation to restore or rehabilitate the Contractor's premises under any circumstances (e.g., abandonment, disposition upon completion of need, or upon contract completion). However, if the Government-furnished property (listed in the Schedule or specifications) is withdrawn or is unsuitable for the intended use, or if other Government property is substituted, then the equitable adjustment under paragraph (h) of this clause may properly include restoration or rehabilitation costs.

(k) **Communications.**

All communications under this clause shall be in writing.

(l) **Overseas contracts.**

If this contract is to be performed outside of the United States of America, its territories, or possessions, the words "Government" and "Government-furnished" (wherever they appear in this clause) shall be construed as "United States Government" and "United States Government-furnished," respectively.

61. FAR 52.246-12 INSPECTION OF CONSTRUCTION *(APR 1984)*

(a) Definition. "Work" includes, but is not limited to, materials, workmanship, and manufacture and fabrication of components.

(b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work called for by this contract conforms to contract requirements. The Contractor shall maintain complete inspection records and make them available to the Government. All work shall be conducted under the general direction of the Contracting Officer and is subject to Government inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.

(c) Government inspections and tests are for the sole benefit of the Government and do not-

(1) Relieve the Contractor of responsibility for providing adequate quality control measures;

(2) Relieve the Contractor of responsibility for damage to or loss of the material before acceptance;

(3) Constitute or imply acceptance; or

(4) Affect the continuing rights of the Government after acceptance of the completed work under paragraph (i) below.

(d) The presence or absence of a Government inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specification without the Contracting Officer's written authorization.

(e) The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The Government may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The Government shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.

(f) The Contractor shall, without charge, replace or correct work found by the Government not to conform to contract requirements, unless in the public interest the Government consents to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(g) If the Contractor does not promptly replace or correct rejected work, the Government may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor or (2) terminate for default the Contractor's right to proceed.

(h) If, before acceptance of the entire work, the Government decides to examine already completed work by removing it or tearing it out, the Contractor, on request, shall promptly furnish all necessary facilities, labor, and material. If the work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray the expenses of the examination and of satisfactory reconstruction. However, if the work is found to meet contract requirements, the Contracting Officer shall make an equitable adjustment for the additional services involved in the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.

(i) Unless otherwise specified in the contract, the Government shall accept, as promptly as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the Government's rights under any warranty or guarantee.

62. FAR 52.246-21 WARRANTY OF CONSTRUCTION *(APR 1984)*

(a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (j) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

(b) This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

(c) The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of-

(1) The Contractor's failure to conform to contract requirements; or

(2) Any defect of equipment, material, workmanship, or design furnished.

(d) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

(e) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

(f) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

(g) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall-

(1) Obtain all warranties that would be given in normal commercial practice;

(2) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and

(3) Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

(h) In the event the Contractor's warranty under paragraph (b) of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

(i) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.

(j) This warranty shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

63. FAR 52.247-63 PREFERENCE FOR U.S.-FLAG AIR CARRIERS *(APR 1984)*

(a) "International air transportation," as used in this clause, means transportation by air between a place in the United States and a place outside the United States or between two places both of which are outside the United States.

"United States," as used in this clause, means the 50 States, the District of Columbia, the Commonwealth of Puerto Rico, and possessions of the United States.

"U.S.-flag air carrier," as used in this clause, means an air carrier holding a certificate under section 401 of the Federal Aviation Act of 1958 (49 U.S.C. 1371).

(b) Section 5 of the International Air Transportation Fair Competitive Practices Act of 1974 (49 U.S.C. 1517) (Fly America Act) requires that all Federal agencies and Government contractors and subcontractors use U.S.-flag air carriers for U.S. Government-financed international air transportation of personnel (and their personal effects) or property, to the extent that service by those carriers is available. It requires the Comptroller General of the United States, in the absence of satisfactory proof of the necessity for foreign-flag air transportation, to disallow expenditures from funds, appropriated or otherwise established for the account of the United States, for international air transportation secured aboard a foreign-flag air carrier if a U.S.-flag air carrier is available to provide such services.

(c) The Contractor agrees, in performing work under this contract, to use U.S.-flag air carriers for international air transportation of personnel (and their personal effects) or property to the extent that service by those carriers is available.

(d) In the event that the Contractor selects a carrier other than a U.S.-flag air carrier for international air transportation, the Contractor shall include a certification on vouchers involving such transportation essentially as follows:

CERTIFICATION OF UNAVAILABILITY OF U.S.-FLAG AIR CARRIERS

I hereby certify that international air transportation of persons (and their personal effects) or property by U.S.-flag air carrier was not available or it was necessary to use foreign-flag air carrier service for the following reasons (see section 47.403 of the Federal Acquisition Regulation):

(State reasons): .....

(End of Certification)

(e) The Contractor shall include the substance of this clause, including this paragraph (e), in each subcontract or purchase under this contract that may involve international air transportation.

64. FAR 52.247-64 PREFERENCE FOR PRIVATELY OWNED U.S.-FLAG COMMERCIAL VESSELS *(APR 1984)*

(a) The Cargo Preference Act of 1954 (46 U.S.C. 1241(b)) requires that Federal departments and agencies shall transport in privately owned U.S.-flag commercial vessels at least 50 percent of the gross tonnage of equipment, materials, or commodities that may be transported in ocean vessels (computed separately for dry bulk carriers, dry cargo liners, and tankers). Such transportation shall be accomplished when any equipment, materials, or commodities, located within or outside the United States, that may be transported by ocean vessel are-

(1) Acquired for a U.S. Government agency account;

(2) Furnished to, or for the account of, any foreign nation without provision for reimbursement;

(3) Furnished for the account of a foreign nation in connection with which the United States advances funds or credits, or guarantees the convertibility of foreign currencies; or

(4) Acquired with advance of funds, loans, or guaranties made by or on behalf of the United States.

(b) The Contractor shall use privately owned U.S.-flag commercial vessels to ship at least 50 percent of the gross tonnage involved under this contract (computed separately for dry bulk carriers, dry cargo liners, and tankers) whenever shipping any equipment, materials, or commodities under the conditions set forth in paragraph (a) above, to the extent that such vessels are available at rates that are fair and reasonable for privately owned U.S.-flag commercial vessels.

(c) (1) The Contractor shall submit one legible copy of a rated on-board ocean bill of lading for each shipment to both (i) the Contracting Officer and (ii) the Division of National Cargo, Office of Market Development, Maritime Administration, U.S. Department of Transportation, Washington, DC 20590. Subcontractor bills of lading shall be submitted through the Prime Contractor.

(2) The Contractor shall furnish these bill of lading copies (i) within 20 working days of the date of loading for shipments originating in the United States or (ii) within 30 working days for shipments originating outside the United States. Each bill of lading copy shall contain the following information:

(A) Sponsoring U.S. Government agency.
(B) Name of vessel.
(C) Vessel flag of registry.
(D) Date of loading.
(E) Port of loading.
(F) Port of final discharge.
(G) Description of commodity.
(H) Gross weight in pounds and cubic feet if available.
(I) Total ocean freight revenue in U.S. dollars.

(d) Except for small purchases as described in 48 CFR 13, the Contractor shall insert the substance of this clause, including this paragraph (d), in all subcontracts or purchase orders under this contract.

(e) The requirement in paragraph (a) does not apply to-

(1) Small purchases as defined in 48 CFR 13;

(2) Cargoes carried in vessels of the Panama Canal Commission or as required or authorized by law or treaty;

(3) Ocean transportation between foreign countries of supplies purchased with foreign currencies made available, or derived from funds that are made available, under the Foreign Assistance Act of 1961 (22 U.S.C. 2353); and

(4) Shipments of classified supplies when the classification prohibits the use of non-Government vessels.

(f) Guidance regarding fair and reasonable rates for privately owned U.S.-flag commercial vessels may be obtained from the Division of National Cargo, Office of Market Development, Maritime Administration, U.S. Department of Transportation, Washington, DC 20590, Phone: 202-426-4610.

65. DEAR 952.247-70 FOREIGN TRAVEL *(APR 1984)*

(a) Foreign travel, when charged directly, shall be subject to the prior approval of the contracting officer for each separate trip regardless of whether funds for such travel are contained in an approved budget. Foreign travel is defined as any travel outside of Canada and the United States and its territories and possessions.

(b) Request for approval shall be submitted at least 45 days prior to the planned departure date, be on a Request for Approval of Foreign Travel form, and when applicable, include a notification of proposed soviet-bloc travel.

66. FAR 52.248-3 VALUE ENGINEERING-CONSTRUCTION *(APR 1984)*

(a) **General.** The Contractor is encouraged to develop, prepare, and submit value engineering change proposals (VECP's) voluntarily. The Contractor shall share in any instant contract savings realized from accepted VECP's, in accordance with paragraph (f) below.

(b) **Definitions.** "Collateral costs," as used in this clause, means agency costs of operation, maintenance, logistic support, or Government-furnished property.

"Collateral savings," as used in this clause, means those measurable net reductions resulting from a VECP in the agency's overall projected collateral costs, exlcusive of acquisition savings, whether or not the acquisition cost changes.

"Contractor's development and implementation costs," as used in this clause, means those costs the Contractor incurs on a VECP specifically in developing, testing, preparing, and submitting the VECP, as well as those costs the Contractor incurs to make the contractual changes required by Government acceptance of a VECP.

"Government costs," as used in this clause, means those agency costs that result directly from developing and implementing the VECP, such as any net increases in the cost of testing, operations, maintenance, and logistic support. The term does not include the normal administrative costs of processing the VECP.

"Instant contract savings," as used in this clause, means the estimated reduction in Contractor cost of performance resulting from acceptance of the VECP, minus allowable Contractor's development and implementation costs, including subcontractors' development and implementation costs (see paragraph (h) below).

"Value engineering change proposal (VECP)" means a proposal that-

(1) Requires a change to this, the instant contract, to implement; and

(2) Results in reducing the contract price or estimated cost without impairing essential functions or characteristics; provided, that it does not involve a change-

(i) In deliverable end item quantities only; or

(ii) To the contract type only.

(c) **VECP preparation.** As a minimum, the Contractor shall include in each VECP the information described in subparagraphs (1) through (7) below. If the proposed change is affected by contractually required configuration management or similar procedures, the instructions in those procedures relating to format, identification, and priority assignment shall govern VECP preparation. The VECP shall include the following:

(1) A description of the difference between the existing contract requirement and that proposed, the comparative advantages and disadvantages of each, a justification when an item's function or characteristics are being altered, and the effect of the change on the end item's performance.

(2) A list and analysis of the contract requirements that must be changed if the VECP is accepted, including any suggested specification revisions.

(3) A separate, detailed cost estimate for (i) the affected portions of the existing contract requirement and (ii) the VECP. The cost reduction associated with the VECP shall take into account the Contractor's allowable development and implementation costs, including any amount attributable to subcontracts under paragraph (h) below.

(4) A description and estimate of costs the Government may incur in implementing the VECP, such as test and evaluation and operating and support costs.

(5) A prediction of any effects the proposed change would have on collateral costs to the agency.

(6) A statement of the time by which a contract modification accepting the VECP must be issued in order to achieve the maximum cost reduction, noting any effect on the contract completion time or delivery schedule.

(7) Identification of any previous submissions of the VECP, including the dates submitted, the agencies and contract numbers involved, and previous Government actions, if known.

(d) **Submission.** The Contractor shall submit VECP's to the Resident Engineer at the worksite, with a copy to the Contracting Officer.

(e) **Government action.** (1) The Contracting Officer shall notify the Contractor of the status of the VECP within 45 calendar days after the contracting office receives it. If additional time is required, the Contracting Officer shall notify the Contractor within the 45-day period and provide the reason for the delay and the expected date of the decision. The Government will process VECP's expeditiously; however, it shall not be liable for any delay in acting upon a VECP.

(2) If the VECP is not accepted, the Contracting Officer shall notify the Contractor in writing, explaining the reasons for rejection. The Contractor may withdraw any VECP, in whole or in part, at any time before it is accepted by the Government. The Contracting Officer may require that the Contractor provide written notification before undertaking significant expenditures for VECP effort.

(3) Any VECP may be accepted, in whole or in part, by the Contracting Officer's award of a modification to this contract citing this clause. The Contracting Officer may accept the VECP, even though an agreement on price reduction has not been reached, by issuing the Contractor a notice to proceed with the change. Until a notice to proceed is issued or a contract modification applies a VECP to this contract, the Contractor shall perform in accordance with the existing contract. The Contracting Officer's decision to accept or reject all or part of any VECP shall be final and not subject to the Disputes clause or otherwise subject to litigation under the Contract Disputes Act of 1978 (41 U.S.C. 601-613).

(f) **Sharing.** (1) *Rates.* The Contractor's share of savings is determined by subtracting Government costs from instant contract savings and multiplying the result by (i) 55 percent for fixed-price contracts or (ii) 25 percent for cost-reimbursement contracts.

(2) *Payment.* Payment of any share due the Contractor for use of a VECP on this contract shall be authorized by a modification to this contract to-

(i) Accept the VECP;

(ii) Reduce the contract price or estimated cost by the amount of instant contract savings; and

(iii) Provide the Contractor's share of savings by adding the amount calculated under subparagraph (1) above to the contract price or fee.

(g) **Collateral savings.** If a VECP is accepted, the instant contract amount shall be increased by 20 percent of any projected collateral savings determined to be realized in a typical year of use after subtracting any Government costs not previously offset. However, the Contractor's share of collateral savings shall not exceed (1) the contract's firm-fixed-price or estimated cost, at the time the VECP is accepted, or (2) $100,000, whichever is greater. The Contracting Officer shall be the sole determiner of the amount of collateral savings, and that amount shall not be subject to the Disputes clause or otherwise subject to litigation under 41 U.S.C. 601-613.

(h) **Subcontracts.** The Contractor shall include an appropriate value engineering clause in any subcontract of $50,000 or more and may include one in subcontracts of lesser value. In computing any adjustment in this contract's price under paragraph (f) above, the Contractor's allowable development and implementation costs shall include any subcontractor's allowable development and implementation costs clearly resulting from a VECP accepted by the Government under this contract, but shall exclude any value engineering incentive payments to a subcontractor. The Contractor may choose any arrangement for subcontractor value engineering incentive payments; provided, that these payments shall not reduce the Government's share of the savings resulting from the VECP.

(i) **Data.** The Contractor may restrict the Government's right to use any part of a VECP or the supporting data by marking the following legend on the affected parts:

"These data, furnished under the Value Engineering-Construction clause of contract....., shall not be disclosed outside the Government or duplicated, used, or disclosed, in whole or in part, for any purpose other than to evaluate a value engineering change proposal submitted under the clause. This restriction does not limit the Government's right to use information contained in these data if it has been obtained or is otherwise available from the Contractor or from another source without limitations."

If a VECP is accepted, the Contractor hereby grants the Government unlimited rights in the VECP and supporting data, except that, with respect to data qualifying and submitted as limited rights technical data, the Government shall have the rights specified in the contract modification implementing the VECP and shall appropriately mark the data. (The terms "unlimited rights" and "limited rights" are defined in Part 27 of the Federal Acquisition Regulation.)

67. FAR 52.249-1 TERMINATION FOR CONVENIENCE OF THE GOVERNMENT- FIXED-PRICE-SHORT FORM-ALTERNATE I *(APR 1984)*

NOTE: This clause applies to this contract only if the price is $100,000 or less.

(a) The Contracting Officer, by written notice, may terminate this contract, in whole or in part, when it is in the Government's interest. If this contract is terminated, the rights, duties, and obligations of the parties, including compensation of the Contractor, shall be in accordance with Part 49 of the Federal Acquistion Regulation in effect on the date of this contract.

(b) Upon receipt of the termination notice, if title to property is vested in the Contractor under this contract, it shall revest in the Government regardless of any other clause of the contract, except for property that the Contractor (a) disposed of by bona fide sale or (b) removed from the site.

68. FAR 52.249-2 TERMINATION FOR CONVENIENCE OF THE GOVERNMENT- FIXED-PRICE-ALTERNATE I *(APR 1984)*

NOTE: This clause applies to this contract if the price exceeds $100,000.

(a) The Government may terminate performance of work under this contract in whole or, from time to time, in part if the Contracting Officer determines that a termination is in the Government's interest. The Contracting Officer shall terminate by delivering to the Contractor a Notice of Termination specifying the extent of termination and the effective date.

(b) After receipt of a Notice of Termination, and except as directed by the Contracting Officer, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due under this clause:

(1) Stop work as specified in the notice.

(2) Place no further subcontracts or orders (referred to as subcontracts in this clause) for materials, services, or facilities, except as necessary to complete the continued portion of the contract.

(3) Terminate all subcontracts to the extent they relate to the work terminated.

(4) Assign to the Government, as directed by the Contracting Officer, all right, title, and interest of the Contractor under the subcontracts terminated, in which case the Government shall have the right to settle or to pay any termination settlement proposal arising out of those terminations.

(5) With approval or ratification to the extent required by the Contracting Officer, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts; the approval or ratification will be final for purposes of this clause.

(6) As directed by the Contracting Officer, transfer title and deliver to the Government (i) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced or acquired for the work terminated, and (ii) the completed or partially completed plans, drawings, information, and other property that, if the contract had been completed, would be required to be furnished to the Government.

(7) Complete performance of the work not terminated.

(8) Take any action that may be necessary, or that the Contracting Officer may direct, for the protection and preservation of the property related to this contract that is in the possession of the Contractor and in which the Government has or may acquire an interest.

(9) Use its best efforts to sell, as directed or authorized by the Contracting Officer, any property of the types referred to in subparagraph (6) above; *provided*, however, that the Contractor (i) is not required to extend credit to any purchaser and (ii) may acquire the property under the conditions prescribed by, and at prices approved by, the Contracting Officer. The proceeds of any transfer or disposition will be applied to reduce any payments to be made by the Government under this contract, credited to the price or cost of the work, or paid in any other manner directed by the Contracting Officer.

(c) After expiration of the plant clearance period as defined in Subpart 45.6 of the Federal Acquisition Regulation, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of termination inventory not previously disposed of, excluding items authorized for disposition by the Contracting Officer. The Contractor may request the Government to remove those items or enter into an agreement for their storage. Within 15 days, the Government will accept title to those items and remove them or enter into a storage agreement. The Contracting Officer may verify the list upon removal of the items, or if stored, within 45 days from submission of the list, and shall correct the list, as necessary, before final settlement.

(d) After termination, the Contractor shall submit a final termination settlement proposal to the Contracting Officer in the form and with the certification prescribed by the Contracting Officer. The Contractor shall submit the proposal promptly, but no later than 1 year from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 1-year period. However, if the Contracting Officer determines that the facts justify it, a termination settlement proposal may be received and acted on after 1 year or any extension. If the Contractor fails to submit the proposal within the time allowed, the Contracting Officer may determine, on the basis of information available, the amount, if any, due the Contractor because of the termination and shall pay the amount determined.

(e) Subject to paragraph (d) above, the Contractor and the Contracting Officer may agree upon the whole or any part of the amount to be paid because of the termination. The amount may include a reasonable allowance for profit on work done. However, the agreed amount, whether under this paragraph (e) or paragraph (f) below, exclusive of costs shown in subparagraph (f)(3) below, may not exceed the total contract price as reduced by (a) the amount of payments previously made and (2) the contract price of work not terminated. The contract shall be amended, and the Contractor paid the agreed amount. Paragraph (f) below shall not limit, restrict, or affect the amount that may be agreed upon to be paid under this paragraph.

(f) If the Contractor and Contracting Officer fail to agree on the whole amount to be paid the Contractor because of the termination of work, the Contracting Officer shall pay the Contractor the amounts determined as follows, but without duplication of any amounts agreed upon under paragraph (e) above:

(1) For contract work performed before the effective date of termination, the total (without duplication of any items) of-

(i) The cost of this work;

(ii) The cost of settling and paying termination settlement proposals under terminated subcontracts that are properly chargeable to the terminated portion of the contract if not included in subdivision (i) above; and

(iii) A sum, as profit on (i) above, determined by the Contracting Officer under 49.202 of the Federal Acquisition Regulation, in effect on the date of this contract, to be fair and reasonable; however, if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, the Contracting Officer shall allow no profit under this subdivision (iii) and shall reduce the settlement to reflect the indicated rate of loss.

(2) The reasonable costs of settlement of the work terminated, including-

(i) Accounting, legal, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data;

(ii) The termination and settlement of subcontracts (excluding the amounts of such settlements); and

(iii) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of the termination inventory.

(g) Except for normal spoilage, and except to the extent that the Government expressly assumed the risk of loss, the Contracting Officer shall exclude from the amounts payable to the Contractor under paragraph (f) above, the fair value, as determined by the Contracting Officer, of property that is destroyed, lost, stolen, or damaged so as to become undeliverable to the Government or to a buyer.

(h) The cost principles and procedures of Part 31 of the Federal Acquisition Regulation, in effect on the date of this contract, shall govern all costs claimed, agreed to, or determined under this clause.

(i) The Contractor shall have the right of appeal, under the Disputes clause, from any determination made by the Contracting Officer under paragraph (d), (f), or (k), except that if the Contractor failed to submit the termination settlement proposal within the time provided in paragraph (d) or (k), and failed to request a time extension, there is no right of appeal. If the Contracting Officer has made a determination of the amount due under paragraph (d), (f), or (k), the Government shall pay the Contractor (1) the amount determined by the Contracting Officer if there is no right of appeal or if no timely appeal has been taken, or (2) the amount finally determined on an appeal.

(j) In arriving at the amount due the Contractor under this clause, there shall be deducted-

(1) All unliquidated advance or other payments to the Contractor under the terminated portion of this contract;

(2) Any claim which the Government has against the Contractor under this contract; and

(3) The agreed price for, or the proceeds of sale of, materials, supplies, or other things acquired by the Contractor or sold under the provisions of this clause and not recovered by or credited to the Government.

(k) If the termination is partial, the Contractor may file a proposal with the Contracting Officer for an equitable adjustment of the price(s) of the continued portion of the contract. The Contracting Officer shall make any equitable adjustment agreed upon. Any proposal by the Contractor for an equitable adjustment under this clause shall be requested within 90 days from the effective date of termination unless extended in writing by the Contracting Officer.

(l) (1) The Government may, under the terms and conditions it prescribes, make partial payments and payments against costs incurred by the Contractor for the terminated portion of the contract, if the Contracting Officer believes the total of these payments will not exceed the amount to which the Contractor will be entitled.

(2) If the total payments exceed the amount finally determined to be due, the Contractor shall repay the excess to the Government upon demand, together with interest computed at the rate established by the Secretary of the Treasury under 50 U.S.C. App. 1215(b)(2). Interest shall be computed for the period from the date the excess payment is received by the Contractor to the date the excess is repaid. Interest shall not be charged on any excess payment due to a reduction in the Contractor's termination settlement proposal because of retention or other disposition of termination inventory until 10 days after the date of the retention or disposition, or a later date determined by the Contracting Officer because of the circumstances.

(m) Unless otherwise provided in this contract or by statute, the Contractor shall maintain all records and documents relating to the terminated portion of this contract for 3 years after final settlement. This includes all books and other evidence bearing on the Contractor's costs and expenses under this contract. The Contractor shall make these records and documents available to the Government, at the Contractor's office, at all reasonable times, without any direct charge. If approved by the Contracting Officer, photographs, microphotographs, or other authentic reproductions may be maintained instead of original records and documents.

69. FAR 52.249-10 DEFAULT- FIXED- PRICE CONSTRUCTION
(APR 1984)

(a) If the Contractor refuses or fails to prosecute the work or any separable part, with the diligence that will insure its completion within the time specified in this contract including any extension, or fails to complete the work within this time, the Government may, by written notice to the Contractor, terminate the right to proceed with the work (or the separable part of the work) that has been delayed. In this event, the Government may take over the work and complete it by contract or otherwise, and may take possession of and use any materials, appliances, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the Government resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the Government in completing the work.

(b) The Contractor's right to proceed shall not be terminated nor the Contractor charged with damages under this clause, if-

(1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include (i) acts of God or of the public enemy, (ii) acts of the Government in either its sovereign or contractual capacity, (iii) acts of another Contractor in the performance of a contract with the Government, (iv) fires, (v) floods, (vi) epidemics, (vii) quarantine restrictions, (viii) strikes, (ix) freight embargoes, (x) unusually severe weather, or (xi) delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and

(2) The Contractor, within 10 days from the beginning of any delay (unless extended by the Contracting Officer), notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, the time for completing the work shall be extended. The findings of the Contracting Officer shall be final and conclusive on the parties, but subject to appeal under the Disputes clause.

(c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been issued for the convenience of the Government.

(d) The rights and remedies of the Government in this clause are in addition to any other rights and remedies provided by law or under this contract.

70. DOE PR 9-9.102-1 AUTHORIZATION AND CONSENT (JUN 1979)

The Government hereby gives its authorization and consent (without prejudice to any rights of indemnification) for all use and manufacture, in the performance of this contract or any part hereof or any amendment hereto or any subcontract hereunder (including any lower-tier subcontract), of any invention described in and covered by a patent of the United States (a) embodied in the structure or composition of any article the delivery of which is accepted by the Government under this contract or (b) utilized in the machinery, tools or methods, the use of which necessarily results from compliance by the contractor or the using subcontractor with (i) specifications or written provisions now or hereafter forming a part of this contract, or (ii) specific written instructions given by the Contracting Officer directing the manner of performance. The entire liability to the Government for infringement of a patent of the United States shall be determined solely by the provisions of the indemnity clauses, if any, included in this contract or any subcontract hereunder (including all lower-tier subcontracts), and the Government assumes liability for all other infringement to the extent of the authorization and consent hereinabove granted.

71. DOE PR 9-9.103-1 PATENT INDEMNITY (JUN 1979)

NOTE: This clause applies to this contract if the award resulted from formal advertising.

If the amount of this contract is in excess of $10,000 the contractor shall indemnify the Government and its officers, agents, and employees against liability, including costs, for infringement of any United States letters patent (except U.S. letters patent issued upon an application which is now or may hereafter be kept secret or otherwise withheld from issue by order of the Government) arising out of the manufacture or delivery of supplies or out of construction, alteration, modification, or repair of real property (hereinafter referred to as "construction work") under this contract, or out of the use or disposal by or for the account of the Government of such supplies or construction work. The foregoing indemnity shall not apply unless the contractor shall have been informed as soon as practicable by the Government of the suit or action alleging such infringement, and shall have been given such opportunity as is afforded by applicable laws, rules, or regulations to participate in the defense thereof; and further, such indemnity shall not apply to: (a) an infringement resulting from compliance with specific written instructions of the Contracting Officer directing a change in the supplies to be delivered or in the materials or equipment to be used, or directing a manner of performance of the contract not normally used by the contractor; (b) an infringement resulting from addition to or change in, such supplies or components furnished or construction work performed which addition or change was made subsequent to delivery or performance by the contractor; or (c) a claimed infringement which is settled without the consent of the contractor, unless required by final decree of a court of competent jurisdiction.

72. DOE PR 9-9.103-3 PATENT INDEMNITY (JUN 1979)

NOTE: This clause applies to this contract if the award resulted from negotiation.

The contractor shall indemnify the Government and its officers, agents, and employees against liability, including costs, for infringement of U.S. Letters Patent (except U.S. Letters Patent issued upon an application which is now or may hereafter be kept secret or otherwise withheld from issue by order of the Government) resulting from the contractor's: (a) furnishing or supplying standard parts or components which have been sold or offered for sale to public on the commercial open market; or (b) utilizing its normal practices or methods which normally are or have been used in providing goods and services in the commercial open market, in the performance of the contract; or (c) utilizing any parts, components, practices, or methods to the extent to which the contractor has secured indemnification from liability. The foregoing indemnity shall not apply unless the contractor shall have been informed as soon as practicable by the Government of the suit or action alleging such infringement, and shall have been given such opportunity as is afforded by applicable laws, rules, or regulations to participate in the defense thereof; and further, such indemnity shall not apply to a claimed infringement which is settled without the consent of the contractor, unless required by final decree of a court of competent jurisdiction or to an infringement resulting from addition to or change in such supplies or components furnished or construction work performed for which addition or change was made subsequent to delivery or performance by the contractor.

73. DOE PR 9-9.104 NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT (JUN 1979)

The provisions of this clause shall be applicable only if the amount of this contract exceeds $10,000.

(a) The contractor shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this contract of which the contractor has knowledge.

(b) In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this contract or out of the use of any supplies furnished or work or services performed hereunder, the contractor shall furnish to the Government when requested by the Contracting Officer, all evidence and information in possession of the contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the contractor has agreed to indemnify the Government.

(c) This clause shall be included in all subcontracts.

74. DOE PR 9-9.110(c) REPORTING OF ROYALTIES (JUN 1979)

If this contract is in an amount which exceeds $10,000 and if any royalty payments are directly involved in the contract or are reflected in the contract price to the Government, the contractor agrees to report in writing to the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) during the performance of this contract and prior to its completion or final settlement, the amount of any royalties or other payments paid or to be paid by it directly to others in connection with the performance of this contract together with the names and addresses of licensors to whom such payments are made and either the patent numbers involved or such other information as will permit the identification of the patents or other basis on which the royalties are to be paid. The approval of DOE of any individual payments or royalties shall not stop the Government at any time from contesting the enforceability, validity or scope of, or title to, any patent under which a royalty or payments are made.

75. DEAR 952.227-73 ADDITIONAL TECHNICAL DATA REQUIREMENTS (APR 1984)

(a) In addition to the technical data specifed elsewhere in this contract to be delivered, the contracting officer may at any time during the contract performance or within one year after final payment call for the contractor to deliver any technical data first produced or specifically used in the performance of this contract, except technical data pertaining to items of standard commercial design.

(b) The provisions of the Rights in Technical Data clause included in this contract are applicable to all technical data called for under this Additional Technical Data Requirements clause. Accordingly, nothing contained in this clause shall require the contractor to actually deliver any technical data, the delivery of which is excused by paragraph (e) of the Rights in Technical Data clause.

(c) When technical data are to be delivered under this clause, the contractor will be compensated for appropriate costs for converting such data into the prescribed form for reproduction, and for delivery.

76. DEAR 952.227-75 RIGHTS IN TECHNICAL DATA - LONG FORM (APR 1984)

(a) Definitions.

(1) "Technical data" means recorded information regardless of form or characteristic, of a scientific or technical nature. It may, for example, document research, experimental, developmental, or demonstration, or engineering work, or be usable or used to define a design or process, or to procure, produce, support, maintain, or operate material. The data may be graphic or pictorial delineations in media such as drawings or photographs, text in specifications or related performance or design type documents or computer software (including computer programs, computer software data bases, and computer software documentation). Examples of technical data include research and engineering data, engineering drawings and associated lists, specifications, standards, process sheets, manuals, technical reports, catalog item identification, and related information. Technical data as used herein do not include financial reports, cost analyses, and other information incidental to contract administration.

(2) "Proprietary data" means technical data which embody trade secrets developed at private expense, such as design procedures or techniques, chemical composition of materials, or manufacturing methods, processes, or treatments, including minor modifications thereof, provided that such data:

(i) Are not generally known or available from other sources without obligation concerning their confidentiality;

(ii) Have not been made available by the owner to others without obligation concerning its confidentiality; and

(iii) Are not already available to the Government without obligation concerning their confidentiality.

(3) "Contract data" means technical data first produced in the performance of the contract; technical data which are specified to be delivered under the contract; technical data that may be called for under the Additional Technical Data Requirements clause of the contract, if any, or technical data actually delivered in connection with the contract.

(4) "Unlimited rights" means rights to use, duplicate, or disclose techincal data, in whole or in part, in any manner and for any purpose whatsoever, and to permit others to do so.

(b) Allocation of rights.

(1) The Government shall have:

(i) Unlimited rights in contract data except as otherwise provided below with respect to proprietary data;

(ii) The right to remove, cancel, correct or ignore any marking not authorized by the terms of this contract on any technical data furnished hereunder, if in response to a written inquiry by DOE concerning the propriety of the markings, the contractor fails to respond thereto within 60 days or fails to substantiate the propriety of the markings. In either case, DOE will notify the contractor of the action taken;

(iii) No rights under this contract in any technical data which are not contract data.

(2) The contractor shall have:

(i) The right to withhold proprietary data in accordance with the provisions of this clause; and

(ii) The right to use for its private purposes, subject to patent, security or other provisions of this contract data it first produces in the performance of this contract, provided the data requirements of this contract have been met as of the date of the private use of such data. The contractor agrees that to the extent it receives or is given access to proprietary data or other technical, business or financial data in the form of recorded information from DOE or a DOE contractor or subcontractor, the contractor shall treat such data in accordance with any restrictive legend contained thereon, unless use is specifically authorized by prior written approval of the Contracting Officer.

(3) Nothing contained in this Rights in Technical Data clause shall imply a license to the Government under any patent or be construed as affecting the scope of any licenses or other rights otherwise granted to the Government under any patent.

(c) Copyrighted material.

(1) The contractor shall not, without prior written authorization of the Patent Counsel, establish a claim to statutory copyright in any contract data first produced in the performance of the contract. To the extent such authorization is granted, the Government reserves for itself and others acting on its behalf a royalty-free, nonexclusive, irrevocable, worldwide license for Governmental purposes to publish, distribute, translate, duplicate exhibit and perform any such data copyrighted by the contractor.

(2) The contractor agrees not to include in the technical data delivered under the contract any material copyrighted by the contractor and not to knowingly include any material copyrighted by others, without first granting or obtaining at no cost a license therein for the benefit of the Government of the same scope as set forth in paragraph (c)(1) above. If such royalty-free license is unavailable and the contractor nevertheless determines that such copyrighted material must be included in the technical data to be delivered, rather than merely incorporated therein by reference, the contractor shall obtain the written authorization of the Contracting Officer to include such copyrighted material in the technical data prior to its delivery.

(d) Subcontracting. It is the responsibility of the contractor to obtain from its subcontractors technical data and rights therein, on behalf of the Government, necessary to fulfill the contractor's obligations to the Government with respect to such data. In the event of refusal by a subcontractor to accept a clause affording the Government such rights, the contractor shall:

(1) Promptly submit written notice to the Contracting Officer setting forth reasons for the subcontractor refusal and other pertinent information which may expedite disposition of the matter; and

(2) Not proceed with the subcontract without the written authorization of the Contracting Officer.

(e) Withholding of proprietary data.

Notwithstanding the inclusion of the Additional Technical Data Requirements clause in this contract or any provision of this contract specifying the delivery of technical data, the contractor may withhold proprietary data from delivery, provided that the contractor furnishes in lieu of any such proprietary data so withheld technical data

disclosing the source, size, configuration, mating and attachment characteristics, functional characteristics, and performance requirements ("Form, Fit and Function" data, e.g., specification control drawings, catalog sheets, envelope drawings, etc.), or a general description of such proprietary data where "Form, Fit and Function" data are not applicable. The Government shall acquire no rights to any proprietary data so withheld except that such data shall be subject to the "inspection rights" provisions of paragraph (f) and, if included, the "Limited rights in proprietary data" provisions of paragraph (g) and the "Contractor licensing" provisions of paragraph (h).

(f) Inspection rights. Except as may be otherwise specified in this contract for specific items of proprietary data which are not subject to this paragraph, the Contracting Officer's representatives, at all reasonable times up to three years after final payment under this contract, may inspect at the contractor's facility any proprietary data withheld under paragraph (e) and not furnished under paragraph (g) if this contract includes such paragraph, for the purposes of verifying that such data properly fell within the withholding provision of paragraph (e), or for evaluating work performance.

77. DEAR 952.227-82 RIGHTS TO PROPOSAL DATA (APR 1984)

Except for technical data contained on pages (See Section H of this contract) of the contractor's proposal dated (See Section H of this contract) which are asserted by the contractor as being proprietary data, it is agreed that, as a condition of the award of this contract, and notwithstanding the provisions of any notice appearing on the proposal, the Government shall have the right to use, duplicate, disclose and have others do so for any purpose whatsoever, the technical data contained in the proposal upon which this contract is based.

78. FAR 52-212-11 VARIATION IN ESTIMATED QUANTITY (APR 1984)

If the quantity of a unit-priced item in this contract is an estimated quantity and the actual quantity of the unit-priced item varies more than 15 percent above or below the estimated quantity, an equitable adjustment in the contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above 115 percent or below 85 percent of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Contractor may request, in writing, an extension of time, to be received by the Contracting Officer within 10 days from the beginning of the delay, or within such further period as may be granted by the Contracting Officer before the date of final settlement of the contract. Upon the receipt of a written request for an extension, the Contracting Officer shall ascertain the facts and make an adjustment for extending the completion date as, in the judgement of the Contracting Officer, is justified.

SECTION J

LIST OF DOCUMENT EXHIBITS AND OTHER ATTACHMENTS

This solicitation consists of the following:

Part I - The Schedule, Sections A, B, C, E, F, G, And H

Part II - Contract Clauses, Section I

Part III - List of Documents, Exhibits and Other Attachments, Section J

Specifications No. WC-4-15906-132

Drawings - 144 sheets

Part IV - Representations and Instructions, Sections K, L, and M.

SECTION K

REPRESENTATIONS, CERTIFICATIONS, AND OTHER STATEMENTS OF BIDDERS

1. CERTIFICATE OF INDEPENDENT PRICE DETERMINATION

a. The offeror certifies that-

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to (i) those prices, (ii) the intention to submit an offer, or (iii) the methods or factors used to calculate the prices offered;

(2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a formally advertised solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

b. Each signature on the offer is considered to be a certification by the signatory that the signatory-

(1) Is the person in the offeror's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs a(1) through a(3) above; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs a(1) through a(3) above _____ (insert full name of person(s) in the offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror's organization);

(ii) As an authorized agent, does certify that the principals named in subdivision b(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs a(1) through a(3) above; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs a(1) through a(3) above.

c. If the offeror deletes or modifies subparagraph a(2) above, the offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

2. CONTINGENT FEE REPRESENTATION AND AGREEMENT (APR 1984)

a. Representation. The offeror represents that, except for full-time bona fide employees working solely for the offeror, the offeror-

(1) /_/ has, /_/ has not employed or retained any person or company to solicit or obtain this contract; and

(2) /_/ has, /_/ has not paid or agreed to pay to any person or company employed or retained to solicit or obtain this contract any commission, percentage, brokerage, or other fee contingent upon or resulting from the award of this contract.

b. Agreement. The offeror agrees to provide information relating to the above Representation as requested by the Contracting Officer and, when subparagraph a(1) or a(2) is answered affirmately, to g?©_g"*b jx@_&" "© "mt p©/"?!®"&/) Officer-

(1) A completed Standard Form 119, Statement of Contingent or Other Fees, (SF 119); or

(2) A signed statement indicating that the SF 119 was previously submitted to the same contracting office, including the date and applicable solicitation or contract number, and representing that the prior SF 119 applies to this offer or quotation.

3. TYPE OF BUSINESS ORGANIZATION - FORMAL ADVERTISING (APR 1984)

The bidder, by checking the applicable box, represents that it operates as /_/ a corporation incorporated under the laws of the State of _____, /_/ an individual, /_/ a partnership, /_/ a nonprofit organization, or /_/ a joint venture.

4. SMALL BUSINESS CONCERN REPRESENTATION (APR 1984)

The offeror represents and certifies as part of its offer that it /_/ is, /_/ is not a small business concern and that /_/ all, /_/ not all supplies to be furnished will be manufactured or produced by a small business concern in the United States, its possessions, or Puerto Rico. "Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the size standards in this solicitation.

5. SMALL DISADVANTAGED BUSINESS CONCERN REPRESENTATION (APR 1984)

a. Representation. The offeror represents that it /_/ is, /_/ is not a small disadvantagaed business concern.

b. Definitions.

"Asian-Indian American," as used in this provision, means a United States citizen whose origins are in India, Pakistan, or Bangladesh.

"Asian-Pacific American," as used in this provision, means a United States citizen whose origins are in Japan, China, the Philippines, Vietnam, Korea, Samoa, Guam, the U.S. Trust Territory of the Pacific Islands, the Northern Mariana Islands, Laos, Camobida, or Taiwan.

"Native Americans," as used in this provision, means American Indians, Eskimos, Aleuts, and native Hawaiians.

"Small business concern," as used in ths provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria and size standards in 13 CFR 121.

"Small disadvantaged business concern," as used in this provision, means a small business concern that (1) is at least 51 percent owned by one or more individuals who are both socially and economically disadvantaged, or a publicly owned business having at least 51 percent of its stock owned by one or more socially and economically disadvantaged individuals and (2) has its management and daily business controlled by one or more such individuals.

c. Qualified groups. The offeror shall presume that socially and economically disadvantaged individuals include Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Asian-Indian Americans, and other individuals found to be qualified by the SBA under 13 CFR 124.1.

6. WOMEN-OWNED SMALL BUSINESS REPRESENTATION (APR 1984)

a. Representation. The offeror represents that it /_/ is, /_/ is not a women-owned small business concern.

b. Definitions.

"Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominate in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria and size standards in 13 CFR 121.

"Women-owned," as used in this provision, means a small business that is at least 51 percent owned by a woman or women who are U.S. citizens and who also control and operate the business.

7. PARENT COMPANY AND IDENTIFYING DATA (APR 1984)

a. A "parent" company, for the purpose of this provision, is one that owns or controls the activities and basic business policies of the bidder. To own the bidding company means that the parent company must own more than 50 percent of the voting rights in that company. A company may control a bidder as a parent even though not meeting the requirement for such ownership if the parent company is able to formulate, determine, or veto basic policy decisions of the offeror through the use of dominant minority voting rights, use of proxy voting, or otherwise.

b. The bidder /_/ is, /_/ is not (check applicable box) owned or controlled by a parent company.

c. If the bidder checked "is" in paragraph b, above, it shall provide the following information:

Name and Main Office Address of Parent Company (Include Zip Code)	Parent Company's Employer's Identification Number

d. If the bidder checked "is not" in paragraph b. above, it shall insert its own Employer's Identification Number on the following line _____.

8. CERTIFICATION OF NONSEGREGATED FACILITIES. (APR 1984)

a. "Segregated facilities," as used in this provision, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis or race, color, religion, or national origin because of habit, local custom, or otherwise.

b. By the submission of this offer, the offeror certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that is does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The offeror agrees that a breach of this certification is a violation of the Equal Opportunity clause in the contract.

c. The offeror further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) it will-

(1) Obtain identical certifications from proposed subcontractors before the award of subcontracts under which the subcontractor will be subject to the Equal Opportunity clause;

(2) Retain the certifications in the files; and

(3) Forward the following notice to the proposed subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITES.

A Certification of Nonsegregated Facilities must be submitted before the award of a subcontract under which the subcontractor will not be subject to the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

9. PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (APR 1984)

The offeror represents that-

a. It /_/ has, /_/ has not participated in a previous contract or subcontract subject either to the Equal Opportunity clause of this solicitation, the clause originally contained in Section 310 of Executive Order No. 10925, or the clause contained in Section 201 of Executive Order No. 11114;

b. It /_/ has, /_/ has not, filed all required compliance reports; and

c. Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

10. CLEAN AIR AND WATER CERTIFICATION (APR 1984)

The Offeror certifies that-

a. Any facility to be used in the performance of this proposed contract is /_/, is not /_/ listed on the Environmental Protection Agency List of Violating Facilities;

b. The Offeror will immediately notify the Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the Environmental Protection Agency, indicating that any facility that the Offeror proposes to use for the performance of the contract is under consideration to be listed on the EPA List of Violating Facilities; and

c. The Offeror will include a certification substantially the same as this certification, including this paragraph (c), in every nonexempt subcontract.

11. REPRESENTATIONS BY BIDDER PURSUANT TO "BUY AMERICAN ACT-CONSTRUCTION MATERIALS'"

a. Bidder represents that all construction materials to be used, other than those specifically exempt from the requirements of the Buy American Act as listed on the back of this form, will be domestic materials conforming to the clause entitled "Buy American Act-Construction Materials" of the General Provisions except as noted below:

Name of each item of nondomestic material	Quantity (weight, feet,no., etc.)	Cost delivered to the job site
	Total	$

The Contractor will be limited in the use of nondomestic materials to those listed above and those specifically exempt from the requirements of the Buy American Act as listed on the back of this form.

List below the lowest cost of domestic material comparable to each item of nondomestic material shown above, based upon bidder's canvass of domestic suppliers (as required by paragraph (b)(2) on the back of this form).

Name of each item of domestic material comparable to offered nondomestic material	Quantity (weight, feet, no., etc.)	Cost delivered to the job site
	Total	$

INFORMATION REGARDING BUY AMERICAN ACT

(a) The Buy American Act (41 U.S.C. 10a-10d) generally requires that only domestic construction material be used in the performance of this contract. (See the clause entitled "Buy AmericanAct--Construction Materials" General Provisions, Construction Contract.) This requirement does not apply to the following construction material or components:

Antimony	Logs, veneer, and lumber from balsa, greenheart, lignum vitae, mahogany, and teak
Asbestos	
Bauxite	
Chrome ore or chromite	Mica
Cobalt	Nickel
Cork	Rubber and crude latex
Graphite	
Jute and jute burlap	

(b) (1) Furthermore, bids or proposals offering use of additional nondomestic construction material may be acceptable for award if the Government determines that use of comparable domestic construction material is impracticable, or would unreasonably increase the cost, or that domestic construction material (in sufficient and reasonably available commercial quantities and of a satisfactory quality) is unavailable. Reliable evidence shall be furnished justifying such use of additional nondomestic construction material.

(2) Where it is alleged that use of domestic construction material would unreasonably increase the cost:

(i) Data shall be included by the bidder, based on a reasonable canvass of suppliers, demonstrating that the cost of each such domestic construction material would exceed by more than 6 percent the cost of comparable nondomestic construction material. (All costs of delivery to the construction site shall be included, as well as any applicable duty.)

(ii) For evaluation purposes, 6 percent of the cost of all additional nondomestic construction material, which qualifies under paragraph (i) above, will be added to the bid or proposal.

(3) When offering additional nondomestic construction material, bids or proposals may also offer, at stated prices, any available comparable domestic construction material, so as to avoid the possibility that failure of a nondomestic construction material to be acceptable under (1) above will cause rejection of the entire bid.

NOTE: Unless bidder intends to furnish NONDOMESTIC construction materials, it is unnecessary to complete this form, but it should be returned with the bid.

b. Bidders furnishing domestic construction material only should disregard this sheet.

List below alternative bid prices based on the use of domestic materials for schedule items under which foreign materials are offered as listed on the enclosed form entitled "Representations by Bidder Pursuant to 'Buy American Act'" (see paragraph at bottom of front page of form).

Item	Work or Material	Quantity and Unit	Unit Price	Amount

12. COUNTRY OF MANUFACTURER

The product which the offeror proposes to furnish /_/ is, /_/ is not, manufactured, mined, or grown in the United States. If the product is not manufactured, mined, or grown in the United States, the country of manufacturer is _____.

SECTION L

INSTRUCTIONS, CONDITIONS, AND NOTICES TO BIDDERS

1. CONTENTS

This Invitation for Bids, IFB No. DE-FB65-84WP15906 consists of the following documents. These documents are not necessarily contained in the specifications in the order listed hereon but are shown for identification and informational purposes only. All bid submittal documents should be returned when submitting bid.

a. Bid Instruction Documents

(1) Invitation for Bids

b. Bid Submittal Documents

(1) Solicitation, Offer, and Award (Standard Form 1442)
(2) Supplies or Services and Prices
(3) Representations and Certifications and other Statements of Bidders
(4) Bid Bond (Standard Form 24)

c. Contract Documents

(1) Index of General Provisions (Construction Contract)
(2) DOE Standard General Provisions Fixed Price Construction Contracts, Clauses 1 through 78
(3) Specifications No. WC-4-15906-132

2. BIDS

Bids shall be submitted in three copies on Standard Form 1442 and shall be accompanied by Representations, Certifications and Other Statement of Bidders, all in accordance with these instructions. If the bid exceeds $25,000, bonds will be submitted as follows:

a. Bid Bonds. Each bidder shall submit with its bid a Bid Bond (Standard Form 24) with good and sufficient surety or sureties acceptable to the Government, or other security as provided in paragraph 3, in the form of 20 percent of the bid price or $3,000,000.00, whichever is less. The Bid Bond penalty may be expressed in dollars and cents.

b. Performance and Payment Bonds. Within 10 days after the prescribed forms are presented to the bidder to whom award is made for signature, a written contract on the form prescribed by the specifications shall be executed and two bonds, each with good and sufficient

surety or sureties acceptable to the Government, furnished; namely, a Performance Bond (Standard Form 25) and a Payment Bond (Standard Form 25-A). The penal sums of such bond will be as follows:

(1) Performance Bond. The penal sum of the performance bond shall be equal to 100 percent of the contract price.

(2) Payment Bond.

a. When the contract price is $1 million or less, the penal sum shall be 50 percent of the contract price.

b. When the contract price is in excess of $1 million but not more than $5 million, the penal sum shall be 40 percent of the contract price.

c. When the contract price is more than $5 million, the penal sum shall be $2.5 million.

Any bonds furnished will be furnished by the Contractor to the Government prior to commencement of contract performance.

All hand-delivered bids must be delivered to the Department of Energy, Western Area Power Administration, Federal Building, Room 300, 200 4th Street, SW, Huron, South Dakota.
Any bids submitted by hand after the time set for receipt will not be accepted.

3. BID GUARANTEE

a. Failure to furnish a bid guarantee in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

b. The offeror (bidder) shall furnish a bid guarantee in the form of a firm commitment, such as a bid bond, postal money order, certified check, cashier's check, irrevocable letter of credit, or, under Treasury Department regulations, certain bonds or notes of the United States. The Contracting Officer will return bid guarantees, other than bid bonds, (1) to unsuccessful bidders as soon as practicable after the opening of bids, and (2) to the successful bidder upon execution of contractual documents and bonds (including any necessary coinsurance or reinsurance agreements), as required by the bid as accepted.

c. If the successful bidder, upon acceptance of its bid by the Government within the period specified for acceptance, fails to execute all contractual documents or give a bond(s) as required by the solicitation within the time specified, the Contracting Officer may terminate the contract for default.

d. Unless otherwise specified in the bid, the bidder will (1) allow 60 days for acceptance of its bid and (2) give bond within 10 days after receipt of the forms by the bidder.

e. In the event the contract is terminated for default, the bidder is liable for any cost of acquiring the work that exceeds the amount of its bid, and the bid guarantee is available to offset the difference.

4. BIDDER'S QUALIFICATIONS

Before a bid is considered for award, the bidder may be requested by the Government to submit a statement regarding his previous experience in performing comparable work, his business and technical organization, financial resources, and plant available to be used in performing the work.

5. SOLICITATION DEFINITIONS-FORMAL ADVERTISING (APR 1984)

"Advertised", for purposes of this solicitation, includes small business restricted advertising and other types of restricted advertising.

"Offer" means "bid" in formal advertising.

"Solicitation" means an invitation for bids in formal advertising.

6. ACKNOWLEDGEMENT OF AMENDMENTS TO INVITATIONS FOR BIDS (APR 1984)

Bidders shall acknowledge receipt of any amendment to this solicitation (a) by signing and returning the amendment, (b) by identifying the amendment number and date in the space provided for this purpose on the form for submitting a bid, or (c) by letter or telegram. The Government must receive the acknowledgement by the time and at the place specified for receipt of bids.

7. FALSE STATEMENTS IN BIDS (APR 1984)

Bidders must provide full, accurate, and complete information as required by this solicitation and its attachments. The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

8. SUBMISSION OF BIDS (APR 1984)

a. Bids and bid modifications shall be submitted in sealed envelopes or packages (1) addressed to the office specified in the solicitation and (2) showing the time specified for receipt, the solicitation number, and the name and address of the bidder.

b. Telegraphic bids will not be considered unless authorized by the solicitation; however, bids may be modified or withdrawn by written or telegraphic notice, if such notice is received by the time specified for receipt of bids.

9. EXPLANATION TO PROSPECTIVE BIDDERS (APR 1984)

Any prospective bidder desiring an explanation or interpretation of the solicitation, drawings, specifications, etc., must request it in writing soon enough to allow a reply to reach all prospective bidders before the submission of their bids. Oral explanations or instructions given before the award of a contract will not be binding. Any information given a prospective bidder concerning a solicitation will be furnished promptly to all other prospective bidders as an amendment to the solicitation, if that information is necessary in submitting bids or if the lack of it would be prejudicial to other prospective bidders.

10. LATE SUBMISSIONS, MODIFICATIONS, AND WITHDRAWALS OF BIDS (APR 1984)

a. Any bid received at the office designated in the solicitation after the exact time specified for receipt will not be considered unless it is received before award is made and it-

(1) Was sent by registered or certified mail not later than the fifth calendar day before the date specified for receipt of bids (e.g., a bid subitted in response to a solicitation requiring receipt of bids by the 20th of the month must have been mailed by the 15th); or

(2) Was sent by mail (or was a telegraphic bid if authorized), and it is determined by the Government that the late receipt was due solely to mishandling by the Government after receipt at the Government installation.

b. Any modification or withdrawal of a bid is subject to the same conditions as in paragraph a, above.

c. The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent either by registered or certified mail is the U.S. or Canadian Postal Service postmark on the wrapper or on the original receipt from the U.S. or Canadian Postal Service. If neither postmark shows a legible date, the bid, modification, or withdrawal shall be processed as if mailed late. "Postmark" means a printed, stamped, or otherwise placed impression (exclusive of a postage meter machine impression) that is readily identifiable without further action as having been supplied and affixed by employees of the U.S. or Canadian Postal Service on the date of mailing. Therefore, bidders should request the postal clerks to place a hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

d. The only acceptable evidence to establish the time of receipt at the Government installation is the time/date stamp of that installation on the bid wrapper or other documentary evidence of receipt maintained by the installation.

e. Notwithstanding paragraph a. above, a late modification of an otherwise successful bid that makes its terms more favorable to the Government will be considered at any time it is received and may be accepted.

f. A bid may be withdrawn in person by a bidder or its authorized representative if, before the exact time set for receipt of bids, the identity of the person requesting withdrawal is established and that person signs a receipt for the bid.

11. PREPARATION OF BIDS-CONSTRUCTION (APR 1984)

a. Bids must be (1) submitted on the forms furnished by the Government or on copies of those forms, and (2) manually signed. The person signing a bid must initial each erasure or change appearing on any bid form.

b. The bid form may require bidders to submit bid prices for one or more items on various bases, including-

(1) Lump sum bidding;

(2) Alternate prices;

(3) Units of construction; or

(4) Any combination of subparagraphs (1) through (3) above.

c. If the solicitation requires bidding on all items, failure to do so will disqualify the bid. If bidding on all items is not required, bidders should insert the words "no bid" in the space provided for any item on which no price is submitted.

d. Alternate bids will not be considered unless this solicitation authorizes their submission.

12. CONTRACT AWARD-FORMAL ADVERTISING-CONSTRUCTION (APR 1984)

a. The Government will award a contract resulting from this solicitation to the responsible bidder whose bid, conforming to the solicitation, will be most advantageous to the Government, price and other factors considered.

b. The Government may reject any or all bids, and waive informalities or minor irregularities in bids received.

c. The Government may accept any item or combination of items, unless doing so is precluded by a restrictive limitation in the solicitation or the bid.

13. NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (APR 1984)

a. The offeror's attention is called to the Equal Opportunity clause and the Affirmative Action Compliance Requirements for Construction clause of this solicitation.

b. The goals for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for minority participation for each trade	Goals for female participation for each trade
4.1	6.9

These goals are applicable to all the Contractor's construction work performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, the Contractor shall apply the goals established for the geographical area where the work is actually performed. Goals are published periodically in the Federal Register in notice form, and these notices may be obtained from any Office of Federal Contract Compliance Programs office.

c. The Contractor's compliance with Executive Order 11246, as amended, and the regulations in 41 CFR 60-4 shall be based on (1) its implementation of the Equal Opportunity clause, (2) specific affirmative action obligations required by the clause entitled "Affirmative Action Compliance Requirements for Construction," and (3) its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade. The Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or

women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor, or from project to project, for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

d. The Contractor shall provide written notification to the Director, Office of Federal Contract Compliance Programs, within 10 working days following award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the-

(1) Name, address, and telephone number of the subcontractor;

(2) Estimated dollar amount of the subcontract;

(3) Estimated starting and completion dates of the subcontract; and

(4) Geographical area in which the subcontract is to be performed.

e. As used in this Notice, and in any contract resulting from this solicitation, the "covered area" is Montana.

14. MAGNITUDE OF CONSTRUCTION CONTRACT

The estimated cost of construction is between $5,000,000 and $10,000,000.

STANDARD FORM 24
JUNE 1964 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.801

BID BOND

(See Instructions on reverse)

24-103

DATE BOND EXECUTED *(Must not be later than bid opening date)*

PRINCIPAL *(Legal name and business address)*

TYPE OF ORGANIZATION *("X" one)*

☐ INDIVIDUAL ☐ PARTNERSHIP
☐ JOINT VENTURE ☐ CORPORATION

STATE OF INCORPORATION

SURETY(IES) *(Name and business address)*

PENAL SUM OF BOND					BID IDENTIFICATION	
PERCENT OF BID PRICE	AMOUNT NOT TO EXCEED				BID DATE	INVITATION NO.
	MILLION(S)	THOUSAND(S)	HUNDRED(S)	CENTS	FOR *(Construction, Supplies or Services)*	

KNOW ALL MEN BY THESE PRESENTS, That we, the Principal and Surety(ies) hereto, are firmly bound to the United States of America (hereinafter called the Government) in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally: *Provided*, That, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal has submitted the bid identified above.

NOW, THEREFORE, if the Principal, upon acceptance by the Government of his bid identified above, within the period specified therein for acceptance (sixty (60) days if no period is specified), shall execute such further contractual documents, if any, and give such bond(s) as may be required by the terms of the bid as accepted within the time specified (ten (10) days if no period is specified) after receipt of the forms by him, or in the event of failure so to execute such further contractual documents and give such bonds, if the Principal shall pay the Government for any cost of procuring the work which exceeds the amount of his bid, then the above obligation shall be void and of no effect.

Each Surety executing this instrument hereby agrees that its obligation shall not be impaired by any extension(s) of the time for acceptance of the bid that the Principal may grant to the Government, notice of which extension(s) to the Surety(ies) being hereby waived; provided that such waiver of notice shall apply only with respect to extensions aggregating not more than sixty (60) calendar days in addition to the period originally allowed for acceptance of the bid.

IN WITNESS WHEREOF, the Principal and Surety(ies) have executed this bid bond and have affixed their seals on the date set forth above.

PRINCIPAL			
Signature(s)	1. *(Seal)*	2. *(Seal)*	*Corporate Seal*
Name(s) & Title(s) *(Typed)*	1.	2.	

INDIVIDUAL SURETIES		
Signature(s)	1. *(Seal)*	2. *(Seal)*
Name(s) *(Typed)*	1.	2.

CORPORATE SURETY(IES)					
SURETY A	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1.	2.		

CORPORATE SURETY(IES) (Continued)					
SURETY B	Name & Address		STATE OF INC	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2		
	Name(s) & Title(s) *(Typed)*	1.	2.		
SURETY C	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1.	2.		
SURETY D	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1.	2.		
SURETY E	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1	2.		
	Name(s) & Title(s) *(Typed)*	1.	2		
SURETY F	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1.	2.		
SURETY G	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1.	2.		

INSTRUCTIONS

1. This form is authorized for use whenever a bid guaranty is required in connection with construction work or the furnishing of supplies or services. There shall be no deviation from this form without approval by the Administrator of General Services.

2. The full legal name and business address of the Principal shall be inserted in the space designated "Principal" on the face of this form. The bond shall be signed by an authorized person. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of his authority must be furnished.

3. The penal sum of the bond may be expressed as a percentage of the bid price if desired. In such cases, a maximum dollar limitation may be stipulated (e.g., 20% of the bid price but the amount not to exceed _____ dollars).

4. (a) Corporations executing the bond as sureties must be among those appearing on the Treasury Department's list of approved sureties and must be acting within the limitations set forth therein. Where more than a single corporate surety is involved, their names and addresses (city and State) shall be inserted in the spaces (Surety A, Surety B, etc) headed "CORPORATE SURETY(IES)", and in the space designated "SURETY(IES)" on the face of this form only the letter identification of the Sureties shall be inserted.

(b) Where individual sureties execute the bond, they shall be two or more responsible persons. A completed Affidavit of Individual Surety (Standard Form 28), for each individual surety, shall accompany the bond. Such sureties may be required to furnish additional substantiating information concerning their assets and financial capability as the Government may require.

5. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Seal"; and, if executed in Maine or New Hampshire, shall also affix an adhesive seal.

6. The name of each person signing this bid bond should be typed in the space provided.

STANDARD FORM 25-A
JUNE 1964 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.801

PAYMENT BOND

(See Instructions on reverse)

25-203

DATE BOND EXECUTED *(Must be same or later than date of contract)*

PRINCIPAL *(Legal name and business address)*

TYPE OF ORGANIZATION *("X" one)*

☐ INDIVIDUAL ☐ PARTNERSHIP

☐ JOINT VENTURE ☐ CORPORATION

STATE OF INCORPORATION

SURETY(IES) *(Name(s) and business address(es))*

PENAL SUM OF BOND

MILLION(S)	THOUSAND(S)	HUNDRED(S)	CENT(S)

CONTRACT DATE

CONTRACT NO

KNOW ALL MEN BY THESE PRESENTS, That we, the Principal and Surety(ies) hereto, are firmly bound to the United States of America (hereinafter called the Government) in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally: *Provided*, That, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal entered into the contract identified above;

NOW, THEREFORE, if the Principal shall promptly make payment to all persons supplying labor and material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the Surety(ies) being hereby waived, then the above obligation shall be void and of no effect.

IN WITNESS WHEREOF, the Principal and Surety(ies) have executed this payment bond and have affixed their seals on the date set forth above.

PRINCIPAL

Signature(s)	1. *(Seal)*	2. *(Seal)*	*Corporate Seal*
Name(s) & Title(s) *(Typed)*	1.	2.	

INDIVIDUAL SURETY(IES)

Signature(s)	1. *(Seal)*	2. *(Seal)*
Name(s) *(Typed)*	1.	2.

CORPORATE SURETY(IES)

SURETY A	Name & Address		STATE OF INC.	LIABILITY LIMIT	
	Signature(s)	1.	2.		*Corporate Seal*
	Name(s) & Title(s) *(Typed)*	1.	2.		

CORPORATE SURETY(IES) (Continued)					
SURETY B	Name & Address		STATE OF INC	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2		
	Name(s) & Title(s) *(Typed)*	1.	2.		
SURETY C	Name & Address		STATE OF INC	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2		
	Name(s) & Title(s) *(Typed)*	1.	2.		
SURETY D	Name & Address		STATE OF INC	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1.	2.		
SURETY E	Name & Address		STATE OF INC	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1	2		
SURETY F	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2.		
	Name(s) & Title(s) *(Typed)*	1.	2.		
SURETY G	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1.	2		
	Name(s) & Title(s) *(Typed)*	1.	2.		

INSTRUCTIONS

1. This form, for the protection of persons supplying labor and material, shall be used whenever a payment bond is required under the act of August 24, 1935, 49 Stat. 793, as amended (40 U.S.C. 270a–270e). There shall be no deviation from this form without approval by the Administrator of General Services.

2. The full legal name and business address of the Principal shall be inserted in the space designated "Principal" on the face of the form. The bond shall be signed by an authorized person. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of his authority must be furnished.

3. (a) Corporations executing the bond as sureties must be among those appearing on the Treasury Department's list of approved sureties and must be acting within the limitations set forth therein. Where more than a single corporate surety is involved, their names and addresses (city and State) shall be inserted in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY(IES)", and in the space designated "SURETY(IES)" on the face of this form only the letter identification of the Sureties shall be inserted.

(b) Where individual sureties execute the bond, they shall be two or more responsible persons. A completed Affidavit of Individual Surety (Standard Form 28), for each individual surety, shall accompany the bond. Such sureties may be required to furnish additional substantiating information concerning their assets and financial capability as the Government may require.

4. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Seal"; and, if executed in Maine or New Hampshire, shall also affix an adhesive seal.

5. The name of each person signing this payment bond should be typed in the space provided.

☆U.S.GPO:1979-0-281-187/5017

STANDARD FORM 25
JUNE 1967 EDITION
GENERAL SERVICES ADMINISTRATION
FED PROC REG (41 CFR) 1-16.801

PERFORMANCE BOND

(See Instructions on reverse)

DATE BOND EXECUTED *(Must be same or later than date of contract)*

PRINCIPAL *(Legal name and business address)*

TYPE OF ORGANIZATION *("X" one)*

☐ INDIVIDUAL ☐ PARTNERSHIP
☐ JOINT VENTURE ☐ CORPORATION

STATE OF INCORPORATION

SURETY(IES) *(Name(s) and business address(es))*

PENAL SUM OF BOND

MILLION(S)	THOUSAND(S)	HUNDRED(S)	CENT(S)

CONTRACT DATE

CONTRACT NO

KNOW ALL MEN BY THESE PRESENTS, That we, the Principal and Surety(ies) hereto, are firmly bound to the United States of America (hereinafter called the Government) in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally: *Provided*, That, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal entered into the contract identified above;

NOW, THEREFORE, if the Principal shall:

(a) Perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the Government, with or without notice to the Surety(ies), and during the life of any guaranty required under the contract, and shall also perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the Surety(ies) being hereby waived; and

(b) If the said contract is subject to the Miller Act, as amended (40 U.S.C. 270a-270e), pay to the Government the full amount of the taxes imposed by the Government which are collected, deducted, or withheld from wages paid by the Principal in carrying out the construction contract with respect to which this bond is furnished; then the above obligation shall be void and of no effect.

IN WITNESS WHEREOF, the Principal and Surety(ies) have executed this performance bond and have affixed their seals on the date set forth above.

PRINCIPAL

Signature(s)	1. *(Seal)*	2. *(Seal)*	*Corporate Seal*
Name(s) & Title(s) *(Typed)*	1.	2	

INDIVIDUAL SURETY(IES)

Signature(s)	1. *(Seal)*	2 *(Seal)*	
Name(s) *(Typed)*	1.	2.	

CORPORATE SURETY(IES)

SURETY A	Name & Address		STATE OF INC	LIABILITY LIMIT
	Signature(s)	1.	2	*Corporate Seal*
	Name(s) & Title(s) *(Typed)*	1.	2	

CORPORATE SURETY(IES) (Continued)					
SURETY B	Name & Address		STATE OF INC	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1	2		
	Name(s) & Title(s) *(Typed)*	1	2		
SURETY C	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1	2		
	Name(s) & Title(s) *(Typed)*	1	2		
SURETY D	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1	2		
	Name(s) & Title(s) *(Typed)*	1	2		
SURETY E	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1	2		
	Name(s) & Title(s) *(Typed)*	1	2		
SURETY F	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1	2		
	Name(s) & Title(s) *(Typed)*	1	2		
SURETY G	Name & Address		STATE OF INC.	LIABILITY LIMIT	*Corporate Seal*
	Signature(s)	1	2		
	Name(s) & Title(s) *(Typed)*	1	2		

BOND PREMIUM ▶	RATE PER THOUSAND $	TOTAL $

INSTRUCTIONS

1. This form is authorized for use in connection with contracts for construction work or the furnishing of supplies or services. There shall be no deviation from this form without approval by the Administrator of General Services.

2. The full legal name and business address of the Principal shall be inserted in the space designated "Principal" on the face of this form. The bond shall be signed by an authorized person. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of his authority must be furnished.

3. (a) Corporations executing the bond as sureties must be among those appearing on the Treasury Department's list of approved sureties and must be acting within the limitations set forth therein. Where more than a single corporate surety is involved, their names and addresses (city and State) shall be inserted in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY(IES)", and in the space designated "SURETY(IES)" on the face of this form only the letter identification of the Sureties shall be inserted.

(b) Where individual sureties execute the bond, they shall be two or more responsible persons. A completed Affidavit of Individual Surety (Standard Form 28), for each individual surety, shall accompany the bond. Such sureties may be required to furnish additional substantiating information concerning their assets and financial capability as the Government may require.

4. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Seal"; and, if executed in Maine or New Hampshire, shall also affix an adhesive seal.

5. The name of each person signing this performance bond should be typed in the space provided.

☆ U. S. GOVERNMENT PRINTING OFFICE : 1977 O - 241-530 (3250)

SECTION M

EVALUATION FACTORS FOR AWARD

Award will be made in accordance with paragrah 12, Section L.

DIVISION 1 - GENERAL REQUIREMENTS

SUBDIVISION 1.1--GENERAL CONDITIONS

1.1.1 THE REQUIREMENT:

It is required that there be constructed and completed, in accordance with the Construction Contract (Standard Form 1442), including the Contract Clauses and the drawings, the Great Falls-Conrad 230-kV Transmission Line.

The work is situated in Cascade, Teton, and Pondera Counties in the state of Montana. The transmission line location is shown on drawings 1 (GTF-CON 0013), and 2 (GTF-CON 0014).

1.1.2 DESCRIPTION OF WORK:

a. GENERAL: The transmission line will be a single-circuit 230-kilovolt, three-phase, 60-Hertz transmission line constructed on single-pole tubular steel or concrete structures using three 954,000-circular mil, ACSR, 45/7 conductors and one 1/2-inch-diameter, high strength galvanized steel, 7-strand overhead ground wire.

b. PRINCIPAL COMPONENTS: The principal components of the work include the following:

(1) Designing, furnishing and installing single-pole tubular steel or concrete structures.

(2) Placing concrete backfill, earth backfill, and rock backfill as required.

(3) Furnishing, assembling, and installing conductor support assemblies.

(4) Furnishing and stringing three 954,000 curcular mil, ACSR, 45/7 conductors.

(5) Furnishing, assembling, and installing overhead ground wire assemblies.

(6) Furnishing and stringing 1/2-inch, high-strength steel, 7-wire overhead ground wire.

(7) Furnishing and installing gates in existing fences.

(8) Furnishing and installing structure grounding.

(9) Furnishing and installing vibration dampers.

(10) Furnishing and attaching structure signs.

(11) Furnishing and installing hold-down weights.

(12) Furnishing and installing fence grounds.

c. EXISTING ENERGIZED TRANSMISSION LINES: The entire transmission line closely parallels existing energized lines. The Contractor shall implement parallel stringing procedures as specified elsewhere in these specifications when stringing conductors.

1.1.3 COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK:

a. COMPLETION PERIOD: Begin work within 30 calendar days after date of receipt of notice to proceed, and complete construction of the new transmission line by December 1, 1985. The period allowed for the completion of the work shall be reduced by one calendar day for each calendar day in excess of 10 calendar days, or any extension thereof, elapsing between the contractor's return of performance and payment bonds.

For notice to proceed purposes, the contract is divided into two parts as follows:

PART A: Notice to Proceed will be issued as soon as practicable after award of the contract for preparatory work including planning, organizing, scheduling, and procurement of materials.

PART B: Notice to Proceed will be issued on or before May 1, 1985, for on-site construction and all remaining work from Great Falls Substation to Conrad Substation.

Except as otherwise provided for specific submittals, Western will require 40 calendar days for review of drawings or data submitted by the Contractor for approval and this review time will apply to each separate submittal or resubmittal whether the drawings or data are approved, not approved, or returned for revision. If Western uses time in excess of the above-stated number of days for review of any submittal or resubmittal, the excess time will be added to the time allowed for completion of the work affected by such excess time; except, if the review of two or more separate submittals or resubmittals is late and results in concurrent days of excess time, such days will be counted only once in computing an extension of the completion date. The number of calendar days required for review of drawings or data submitted or resubmitted for approval will include the date the drawings or data are received by Western and will extend through the date of return mailing to the Contractor.

b. PROSECUTION OF THE WORK: The capacity of the Contractor's construction plant, sequence of operations, method of operation, and the forces employed shall, at all times during the continuance of the contract, be subject to the COTR's approval and shall be such as to insure the completion of the work within the specified period of time.

The Contractor shall perform work on Part B, starting from Montana Power Company's Great Falls Substation progressing west and north to the termination at Western's new Conrad Substation.

c. PRIORITIES: If performance under these specifications is delayed by operations of any United States national priorities or material allocation system, the time for performance will be extended to compensate for such delays.

1.1.4 CONSTRUCTION PROGRAM:

a. GENERAL: Within 45 calendar days after the date of the notice to proceed, submit to the Contracting Officer's Technical Representative (COTR) for approval a construction program in accordance with the Contract Clause entitled "Schedules for Construction Contracts". Construction program shall show in detail the Contractor's program of operations and shall provide for orderly performance of the work. Pending approval of the program, proceed with the work in accordance with the proposed construction program.

Construction program shall show the percentage of work for each line item or portion of work scheduled for completion each month, and shall include an estimate of earnings by months. Approval of the Contractor's construction program shall not obligate Western to provide funds in any manner other than as provided for in the Contract Clauses and Special Contract Requirements.

b. FORMAT AND DETAIL: Construction program shall show the following:

(1) Sequence of operations.

(2) Dates for commencing and completing the work on the controlling features.

(3) Order issue and delivery dates for Contractor-furnished materials.

(4) Dates on which each item of Western-furnished materials will be required. Construction program dates shall not be earlier than the estimated delivery dates shown in the "Western-Furnished Materials" paragraph.

(5) Leadtimes required for Western-furnished construction drawings. Leadtimes greater than 75 days shall be justified.

(6) Dates on which Contractor-prepared drawings will be submitted for approval.

(7) Dates and length of time of any required power outages.

c. ALTERNATE CPM FORMAT: Work may be programmed by the CPM (Critical Path Method) or by a similar type of network analysis system. CPM program shall include all information required above. Submit translucent reproducibles of the network diagram and of printout or computation sheets. Reproducibles shall permit clear, sharp, legible prints to be made by direct-contact methods. If requested, submit a printout of the computer data.

d. SUBMITTAL REQUIREMENTS:

(1) Form of Submittal: Submit original or translucent reproducible and three blackline prints of the construction program and each revised program. Originals or reproducibles shall permit clear, sharp, legible prints to be made by direct-contact methods.

(2) Revisions: Revise the construction program to keep it current and enter on the program the actual progress at the end of each progress payment period or at such other intervals as directed and submit two marked prints of the program to the COTR.

1.1.5 CONSTRUCTION SURVEYS:

a. GENERAL: Western has located the center of each transmission line structure on the transmission line centerline and marked it with a 1/2-inch rebar and lath. In grassland, the rebar is flush with the ground and in cropland the rebar is buried 12-14 inches below ground surface. Western will only provide survey crew services to reestablish transmission line points of intersection. The Contractor shall verify that the structure site locations meet the accuracy stated in subparagraph b. below and stake auger points for poles and guys. Maintain and preserve all stakes and other marks established by Contractor or by Western until the COTR authorizes their removal.

Refer to the Contract Clause "Layout of Work" for additional survey requirements.

b. SURVEY ACCURACY: Survey work for control shall be of sufficient accuracy to assure the centerline point of each structure site is within 0.2 foot of the true tangent line between points of intersection and within plus or minus 1.0 foot of the correct centerline station. Guys shall be located with an accuracy of plus or minus 1.0 foot. The above accuracies shall be as measured from basic control furnished by Western.

c. DIFFERING CONDITIONS: Conditions encountered during construction that are different than those represented on the drawings shall be accurately noted and furnished to Western for "as-builts".

d. ACCESS EASEMENTS: Stake and mark all Western provided access rights-of-way in accordance with the legal descriptions and plats furnished by Western.

e. PERSONNEL: Survey work shall be under the supervision of a surveyor or engineer whose qualifications shall be subject to the COTR's approval.

f. CLEAN-UP: All survey stakes pins, spikes, and other material shall be removed from within the top 15 inches of the topsoil as a part of final cleanup.

g. HISTORICAL AND ARCHEOLOGICAL SITES: Flag and mark all historical or archeological sites and environmentally sensitive areas as avoidance areas. The location of the sites and areas will be furnished by Western after award of the contract."

1.1.6 DEFINITIONS:

In addition to the terms covered in the Contract Clauses entitled "Definitions" and "Specifications and Drawings for Construction", the terms and definitions listed below apply:

"Western" as used herein means the Western Area Power Administration or its agents.

"COTR" as used herein means the person duly appointed as the Contracting Officer's Technical Representative.

"Approved" or "approval" as used herein shall mean approved by the COTR except where another specific authority is designated.

"Material" or "materials" as used herein to denote items furnished by the Contractor or by Western means machinery, equipment, components, products or any other item incorporated in the work.

"Provide" or "providing" as used herein shall mean "furnish and install" or "furnishing and installing" including all labor and materials to construct or install an item complete and ready for use.

Where "provide", "install", "furnish", "repair" or words of similar import are used, it shall be understood that reference to the Contractor is intended unless clearly indicated otherwise.

"Paragraph" as used herein means all written text designated by a number and includes all subparagraphs under the referenced designation. Paragraph references are by title only if the referenced paragraph is within the same Division. If the referenced paragraph is in a different Division than where the reference is made, the Division title will also be included. When only a portion of the paragraph applies, the reference is made to the paragraph by title and to the applicable portion by referencing the subparagraph (i.e., subparagraph a. of the "Description of Work" paragraph). If reference is made to a subparagraph within the same paragraph, only the subparagraph designation is used (i.e., subparagraph d. below or subparagraph (3) above.

SUBDIVISION 1.2--MATERIALS

1.2.1 WESTERN-FURNISHED MATERIALS:

Western will furnish gate closers for the barbed-wire gates. Gate closers will be delivered to the Contractor at the jobsite after notice to proceed. Replace gate closers lost or damaged after receipt from Western. The cost of hauling, storing, and installing the Western-furnished gate closers shall be included in the barbed wire gate prices bid in Section B.

1.2.2 CONTRACTOR-FURNISHED MATERIALS:

a. GENERAL: Furnish all materials for completion of the work, except materials furnished by Western listed in the "Western-Furnished Materials" paragraph. Refer to the Contract Clause entitled "Material and Workmanship" for additional materials requirements.

b. SUBSTITUTION OF MATERIALS: Provide the type and grade of materials specified, but where materials are unavailable, approved substitute materials may be used. Substitute materials shall not be used without prior written approval. Written approval will state the amount of adjustment, if any, to be made in favor of Western. Adjustment will be made in favor of Western, if the substitute materials cost less to the contractor than the materials specified. Where the amount involved or the importance of the substitution warrants, an order for changes will be issued, otherwise the adjustment will be handled by deduction from payments to the Contractor on the basis of prices stated in the written approval.

c. INSPECTION OF MATERIALS: Contractor-furnished materials shall be subject to inspection in accordance with the Contract Clauses.

1.2.3 REFERENCE SPECIFICATIONS AND STANDARDS:

a. GENERAL: Reference to Federal Specifications, Federal Standards, ANSI/ASTM, or other standard specifications or codes shall be to the latest editions or revisions in effect on the date bids are received, including any amendments or supplements. If requirements between a referenced specification, standard, or code, conflict with these specifications, these specifications shall govern. If materials are not covered by Federal or other specifications, the materials furnished shall be of standard commercial quality. Where types, grades, or other options offered in the referenced specifications are not specified in these specifications, the material furnished will be acceptable if it is in accordance with any one of the types, grades, or options offered.

Copies of Federal Specifications may be examined at Western, 1627 Cole Blvd., Golden, CO 80401.

Single copies of Federal Specifications may be obtained at Business Service Centers of Regional Offices of the General Services Administration. Specifications, standards, and codes published by associations or other standardizing agencies shall be obtained directly from those agencies.

b. ADDRESSES: Addresses for obtaining referenced specifications, standards, and codes are listed below. Information on specifications, standards, and codes not listed below may be obtained from Western, P.O. Box 3402, Golden, CO 80401, Attention: Code A2600.

Federal Specifications and Standards-Specifications Activity, Building 197, Washington Navy Yard, General Services Administration, Washington, DC 20407

Military Specifications and Standards-Naval Publications and Forms Center, 5801 Tabor Avenue, Philadephia, PA 19120

ACI-American Concrete Institute, P.O. Box 19150, Redford Station, Detriot, MI 48219.

AISC-American Institute of Steel Construction, Inc., 400 North Michigan Avenue, Chicago, IL 60611

AISI-American Iron and Steel Institute, 1000 16th Street NW., Washington, DC 20036

ANSI-American National Standards Institute, 1430 Broadway, New York, NY 10018

ASTM-American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103

AWS-American Welding Society, Inc., 2501 NW. Seventh Street, Miami, FL 33125

IEEE-Institute of Electrical and Electronic Engineers, 345 East 47th Street, New York, NY 10017

IPCEA-Insulated Power Cable Engineers Association Inc., P.O. Box P, South Yarmouth, MA 02664

NEC-National Electrical Code, National Fire Protection Association, Battery March Park, Quincy, MA 02269

NEMA-National Electrical Manufacturers Association, 2101 L Street N.W., Washington, D.C. 20037

SUBDIVISION 1.3--LOCAL CONDITIONS

1.3.1 RIGHTS-OF-WAY:

Western will provide the right-of-way for the transmission line and right-of-way for access thereto over routes established by Western.

Transmission line right-of-way is 125 feet wide, except at locations where guys and anchors require additional right-of-way. Western has acquired access easements from existing public roads to the transmission line and a considerable amount of off right-of-way access along the transmission line. This off right-of-way access route is to provide access along the transmission line to structure sites not accessible by traveling the transmission line. Western does not represent the Contractor can travel continuously along the transmission line. The Contractor shall orient his construction methods and equipment to utilize only Western-furnished rights-of-way. Contractor acquisition of additional temporary access will not be allowed since several areas of the transmission line do have travel restricted areas.

1.3.2 ACCESS TO THE WORK AND HAUL ROUTES:

a. GENERAL: Rights-of-way for access to the work from existing roads will be furnished by Western as specified in the "Rights-of-Way" paragraph. Perform work on the rights-of-way necessary for access to or along the transmission line. Only that excavation, dozing, or blading that is absolutely necessary will be allowed. Excavation, dozing or blading for ease of travel may only be performed after field review and approval by the COTR. Unauthorized excavation, dozing, or blading shall immediately be repaired or Western will have the damage repaired and backcharge the Contractor for all costs involved.

All excavation, dozing, or blading done for ease of travel on any easement or for crane landings shall be restored to the original contour of the land and shall be compacted to a dry density not less than the natural in-place dry density of the surrounding earth. The use of water may be required to obtain the required density. Topsoil shall be stockpiled and spread on cuts prior to completion of work under these specifications.

Investigate the condition of available public or private roads and of clearances, restrictions, bridge-load limits, bond requirements, and other limitations that may affect transportation and ingress and egress at the jobsites. Unavailability of transportation facilities or limitations thereon shall not become a basis for claims for damages or extension of completion time. Construct and maintain access roads and drainage structures required for construction operations.

b. EXISTING ROADS: Existing roads are available for use, subject to existing restrictions. Meet all conditions properly imposed upon the use of existing roads by those having jurisdiction thereover, including (without limitation of the generality of the foregoing) seasonal or other limitations or restrictions, the payment of excess size and weight fees, and the posting of bonds conditioned upon repair of road damage caused by the Contractor.

c. HAUL ROUTES: Hauling of such items as concrete or steel poles, earth materials, and other intrajob hauling, over public highways, roads, or bridges shall be in compliance with the applicable local regulations and shall be such as to minimize interference with or congestion of local traffic. Where haul routes cross public highways or roads, provide barricades, flagmen, and other necessary precautions for safety of the public as required by the "Safety and Health Requirements" Subdivision.

1.3.3 USE OF LAND FOR CONSTRUCTION PURPOSES:

a. USE OF GOVERNMENT LAND: Use of Government land, controlled by Western, will be permitted for field offices, storage yards, shops, and other facilities if such use will not interfere with work or of the work of other contractors or of the Government in the vicinity, or with reservations made by Western for use of the land. Personnel housing will not be permitted on Government land, except housing for guards or watchmen as approved by Western.

b. USE OF PRIVATE LAND: If private land is used, make all necessary arrangements with the owner and pay all rentals or other costs connected therewith. Notify Western of all private land to be used and only Western-furnished rights-of-way shall be used for access to the transmission line as specified in the "Rights-of-way" paragraph.

1.3.4 EXISTING FENCES:

a. GENERAL: Fences on the right-of-way shall be removed where necessary and shall be rebuilt in as good condition as found. Where designated, fences shall be maintained until the work is completed or their removal is authorized.

b. TEMPORARY FENCES: Where existing fences are removed to facilitate the work, temporary fence protection for lands adjacent to the right-of-way shall be provided at all times during the continuation of the contract. Such temporary fence protection shall be adequate to prevent public access to restricted areas. Temporary fencing constructed on the right-of-way shall be removed by the Contractor as part of the cleanup operations prior to final acceptance of the completed work.

c. CONTRACTOR'S NONCOMPLIANCE: If the Contractor does not provide the necessary fences and gates to adequately protect property adjacent to the right-of-way within a reasonable time after need for such protection arises, Western will have the work performed and the contractor will be backcharged.

1.3.5 TRANSMISSION, TELEGRAPH, AND TELEPHONE LINES:

a. GENERAL: Make all necessary provisions and perform all work required to avoid interference with the operation or maintenance of transmission, telegraph, and telephone lines in a manner satisfactory to the owners or operators thereof and to Western.

Providing and maintaining all required watchmen, signals, guards, and temporary structures; of making necessary repairs, replacements, or similar operations; of furnishing indemnity or other bonds, if required; and all other work required by this paragraph shall be included in the Schedule for other items of work.

b. STRINGING OVER ENERGIZED POWERLINES: When stringing transmission line conductors or overhead ground wires over energized electric powerlines, notify the owners or operators thereof of the period of time required for stringing, and obtain a written acknowledgment of such notice. Present the acknowledgment to the COTR before stringing of the crossing span is started. All stringing operations shall conform to the applicable safety and transmission line stringing provisions of these specifications.

1.3.6 MAINTAINING PUBLIC TRAFFIC:

a. GENERAL: Make all necessary provisions in accordance with the "Safety and Health Requirements" Subdivision for maintaining the flow of public traffic. Conduct construction operations to offer the least possible obstruction and inconvenience to public traffic.

b. GUARDS AND FLAGPERSONS: Where construction operations and equipment and machinery in use endanger passing traffic, provide guards to insure against accidents and avoid damage or injury to passing traffic. When required or when directed by the COTR, provide and station competent flagpersons whose sole duties shall consist of directing and controlling the movement of public traffic either through or around the work.

1.3.7 GEOLOGIC INVESTIGATIONS:

a. GENERAL: The geologic logs of subsurface explorations included in these specifications, drawings 32 (GTF-CON 8004) through 144 (GTF-CON 8116) constitute the information and records of geologic investigations for the work. Location of subsurface investigations is shown on drawings 28 (GTF-CON 8000) through 31 (GTF-CON 8003).

Alignment shown on geologic drawings may not reflect more recent revisions which appear elsewhere in these specifications.

Samples and core of the recovered material were not retained. Bidders shall obtain their own samples and perform tests on the material to evaluate properties which they believe to be significant.

Copies of a report entitled "Report of Geological Investigations 230-kV Transmission Line between Great Falls and Conrad, Montana" prepared by Northern Engineering and Testing, Billings, Montana may be examined at the following Western Area Power Administration Offices:

Western Area Power Administration
Director, Division of Construction and Inspection
1627 Cole Boulevard
Golden, Colorado 80401

Western Area Power Administration
Assistant Area Manager for Engineering
2525 4th Avenue North
Billings, Montana 59101

Western Area Power Administration
Assistant Area Manager for Construction
200 4th Street SW
Huron, South Dakota 57350-2474

The content of this report may not reflect recent design or alignment revisions which appear in these specifications.

Western does not represent that the available geologic information and records show the conditions that will be encountered in performing the work, but only that the geologic information shows conditions encountered at the particular point and time the information was obtained and may not indicate variations such as those caused by seasonal fluctuations increased rainfall and other factors which may affect the water level. The Contractor shall determine the nature of the materials to be excavated, the difficulties of making and maintaining the required excavations, and of doing other work affected by the geology and ground water elevations at the work site.

b. GEOLOGIC DESCRIPTION: The Great Falls-Conrad Transmission Line is in the Great Plains physiographic province of Montana. Strata exposed along the route is that of the Colorado Group of late Cretaceous age. Surface topography in the northern half of the route was greatly influenced by Pleistocene glaciation. Glacial drift deposits up to about 60 feet thick can be found in the area. The surface topography of the southern half of the route resulted from erosion of bedrock units and fluvial deposition of thin flood plan alluvium, alluvium-colluvium and locustrine deposits. The major drainages are the Teton River, Muddy Creek, and the Missouri River.

Generally, rocks associated with the Colorado Group are soft sandstones and shales; however, locally, the rock is firmly cemented. Also, some of the shales are bentonitic and has numerous bentonite beds throughout. Glacial drift deposits are primarily clay till. These deposits are largely unsorted debris deposited directly from the glaciers. Randomly scattered cobbles and boulders as well as sand and gravel pockets can be encountered in the till. Groundwater can be encountered at or near land surface locally. Perched water can be encountered in the glacial drift at isolated locations.

1.3.8 ELECTRIC POWER FOR CONSTRUCTION PURPOSES:

Make all necessary arrangements and furnish all electric power required for construction purposes.

1.3.9 WATER FOR CONSTRUCTION PURPOSES:

Furnish all water required for construction purposes. Make all arrangements for obtaining the water and provide all means for conveying the water to the points of use.

SUBDIVISION 1.4--SAFETY AND HEALTH REQUIREMENTS

1.4.1 ACCIDENT PREVENTION PROGRAM:

a. GENERAL: Implement and administer an accident prevention program and take all reasonable precautions to protect the safety and health of employees and members of the public and to prevent damage to public and private property. Do not allow any employee whether directly employed or employed through subcontract or onsite supply contract, to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health or safety. The Contract Clause entitled "Accident Prevention" also includes safety and health requirements.

b. CONFLICT IN REQUIREMENTS: If there is a conflict between the requirements of these specifications and applicable Federal, State, or local safety, health or industrial regulations or code, the more stringent requirement shall prevail.

c. OSHA REGULATIONS: Comply with the latest effective standards promulgated by the Secretary of Labor for the Department of Labor, Occupational Safety and Health Administration, Safety and Health Standards (29 CFR 1910) and the Construction Safety and Health Regulations promulgated under section 107 of the Contract Work Hours and Safety Standards Act (29 CFR 1926).

d. CONTRACTOR'S SAFETY PROGRAM: Conduct an accident prevention program commensurate with the work requirements of the contract and submit either a reproducible print or 6 copies of a proposed safety program to the COTR for approval prior to start of construction operations. The approved program shall become a part of the contract. The safety program shall include:

(1) Designation of a competent supervisory employee to carry out the Contractor's accident prevention program.

(2) Statement of company safety policy encompassing compliance with applicable, Federal, State and local safety standards and the safety requirements of these specifications.

(3) Adequate facilities and trained personnel to ensure prompt and efficient first aid and medical care of injured employees (minimum requirements as specified in the "Medical Service" paragraph).

(4) Regularly scheduled and documented safety meetings at least monthly for all levels of supervision.

(5) Weekly "tool box" safety meetings conducted and documented by a supervisor and attended by all employees at the worksite.

(6) Periodic safety policy meetings between Contractor and Western representatives.

(7) Definition of company policies for determining employee skill, proficiency and medical condition required to safely perform the duties of the position.

(8) Orientation and education procedures to assure employee awareness of safety and health policies and regulations.

(9) Fire protection procedures and facilities.

(10) Health and sanitation facilities.

(11) Policy for the use and furnishing of personnel protective equipment.

(12) Procedures that will be implemented to minimize safety hazards peculiar to the work (e.g., structure erection program and stringing plan).

(13) Company policy and procedures for enforcing the safety and health regulations.

(14) Procedures for protecting the public.

(15) Copy of the current certificate of compliance with industrial compensation insurance statutes.

Approval of the safety program, supplements thereto, or any work procedures or plan shall not relieve the Contractor of the responsibility for safety of persons or property.

e. FAILURE TO COMPLY: Failure to fully implement the safety program may result in suspension of all or part of the work until corrected. No extension of time or claim for damage or excess costs will be permitted by reason of the suspension. Failure to correct conditions prompting the suspension will be considered noncontract performance and can ultimately result in termination for default as defined in the Contract Clauses. Western's failure to order discontinuance of the Contractor's operations shall not relieve the Contractor of his responsibility for the safety of personnel and property.

f. RECORDS AND REPORTING: Maintain an accurate record and report to Western in the manner prescribed all cases of death, occupational disease, or traumatic injury to employees or the public and property damaged by accident. Western shall be furnished copies of all certifications and test records including:

(1) Crane Performance Tests.

(2) Crane Annual Inspection Records in accordance with OSHA 1926.580(A)(6).

(3) Brake Performance Test.

(4) Test of Personal Grounds.

(5) Tests of Stringing Blocks and Sheaves.

g. INDEMNITY: Indemnify and hold Western harmless for all losses, damages, or liability on account of personal injury, death, and property damage or claims for personal injury, death, and property damage of any nature whatsoever and by whomsoever made, or arising out of the activities of the Contractor, his employees, subcontractors, or agents. Indemnity shall include, but shall not be limited to, the failure of the Contractor, his employees, subcontractors or agents to comply with these safety and health requirements.

1.4.2 SAFETY OF THE PUBLIC:

a. ROADS: Roads subject to interference by the work shall be kept open without unreasonable delays or suitable detours shall be provided and maintained. Provide, erect, and maintain all necessary barricades, flasher lights, flagpersons, danger signals, and signs, and take all necessary precautions for the protection and safety of the public. Barricades and obstructions shall be illuminated from sunset until sunrise.

b. WARNINGS: Flagpersons shall be stationed at road crossings when warranted by view obstruction or traffic volume. In remote areas where the volume of traffic is light, advance warning signs or flags will suffice. Follow the instructions in ANSI D 6.1 entitled "Manual on Uniform Traffic Control Devices for Streets and Highways". Wire, rope, or chain shall not be used to barricade a travelable trail or roadway.

c. SECURE EQUIPMENT: Secure motor vehicles and mechanized equipment when not in use to prevent rollaways, unauthorized operation, or movement of accessories and attachments.

1.4.3 MEDICAL SERVICE:

a. TRANSPORTATION: Make arrangements or provide for transporting sick or injured personnel from the jobsite to an approved medical facility. Approved transportation shall be available to the worksite within 30 minutes of notification. Transportation facilities shall be approved by the consulting physician.

b. COMMUNICATION: Provide and maintain approved, dependable radio or telephone communications between the jobsite and field office and the nearest emergency medical facility. Procedures and instructions for providing emergency assistance shall be posted at all job locations.

c. INJURY TREATMENT: A person who has a valid certificate in first-aid training from the U.S. Bureau of Mines, the American Red Cross, or equivalent training that can be verified by documentary evidence, shall be available at the worksite wherever employees are engaged in contract work.

1.4.4 EMPLOYEE REQUIREMENTS:

a. GENERAL: Employees shall be physically qualified to perform their assigned duties. Employees shall not work while their ability or alertness is impaired because of fatigue, illness, medications, drugs or alcohol, or any other reason, that may expose them or others to injury.

b. PHYSICAL EXAMINATION: Each employee who operates the following listed equipment shall be given and pass a Department of Transportation (DOT 49 CFR 391.43) physical examination once every 12 months:

(1) Cranes.

(2) Aerial lifts.

(3) Man-haul vehicles is defined as a bus by local State statutes.

(4) Busses.

(5) Personnel hoists.

(6) Material hoists.

A copy of the certificate shall be furnished to COTR. The certificate shall state that the physical examination met the requirements of DOT 49CFR391.43.

1.4.5 PERSONNEL PROTECTIVE EQUIPMENT:

a. HARD HATS: All employees, including equipment operators, field mechanics, and others entering the area where construction work is in progress, with the exception of the parking area and the interior of shops and offices, shall wear hard hats. Provide hard hats for visitors entering hard hat areas. "Hard Hat Area" signs shall be furnished and erected.

b. HIGH VISIBILITY CLOTHING: Employees working around haulage equipment, survey personnel working on or near public thoroughfares, personnel working in areas open to big game hunting, and flagpersons shall wear safety color fluorescent clothing with a reflective area of at least 400 square inches above the waist.

c. PROTECTIVE CHAPS: Protective chaps which meet the latest U.S. Forest Service (USFS) requirements, as stated in USFS Health and Safety Code Handbook 6109.13, Chapter 718.3b, shall be worn when using chain saws.

d. SAFETY BELTS: Safety belts and straps shall be used by workers while on structures.

e. LADDERS:

(1) Hook or other type temporary ladders used on structures shall be provided with a safety device that ensures that the ladder will not be displaced. Ladders shall be inspected daily and repaired or replaced when strength and dependability are reduced.

(2) When working from a ladder, there shall be a single safety rope on each rail extending from the top to the third rung from the bottom. The safety strap shall be around both ladder rails inside the safety rope.

1.4.6 EXCAVATION:

a. BURIED UTILITIES: Prior to start of any excavation, examine the area and determine the location of all buried utilities. Utilities shall be identified with a marker denoting the type of service.

b. AUGERS: Unattended augered holes shall be covered to prevent people and livestock from falling into the excavation.

c. FOOTINGS: The excavation for footings shall be protected by fencing as warranted by conditions such as presence of livestock and the depth and stability of the banks.

d. CONCRETE PLACEMENT:

(1) Safe equipment access, including grading, leveling, and shoring shall be provided to ensure ground stability for mixer trucks and other mobile equipment.

(2) A spotter shall assist truck and equipment operators when adjacent to excavations. Personnel shall be removed from excavations while heavy equipment is being maneuvered nearby.

(3) Work platforms shall be provided as necessary for forming and concrete placement.

1.4.7 EXPLOSIVES AND BLASTING:

a. GENERAL: Submit a controlled blasting plan to Western for review and approval prior to blasting. Blasting will be permitted only after adequate provisions have been made for the protection of persons, the work, and public or private property. No electrical-type blasting system shall be used within 500 feet of energized lines or equipment. Blasting shall be

done between sunrise and sunset. Repair blasting damage to the work or to public or private property.

b. EXPLOSIVES: Transportation, handling, storage, and use of explosives shall conform to Subpart U "Blasting and the Use of Explosives" of the Department of Labor "Safety and Health Regulations for Construction", and the regulations of the Department of the Treasury contained in 26 CFR 181, Commerce in Explosives. "Inhabited building", as shown under the American Table of Distances for Explosive Materials, shall include the Contractor's and Western's offices, shops, warehouses, storage areas, and similar buildings. Contractor's explosive logs shall be available for review by Western at all times.

c. VIBRATION AND DAMAGE CONTROL: Blasting in or adjacent to buildings, dwellings, structures, or other facilities susceptable to vibration or airblast damage shall be carefully planned and controlled to eliminate possibility of damage to such facilities and structures. Plan for control to eliminate vibration and airblast damage, when required, shall be submitted to and approved by the COTR prior to commencement of blasting. Control will include, as a minimum, provision for monitoring blasts with calibrated devices containing triaxial orthogonal velocity transducers with a frequency response from 2 to 200 Hz. Maximum peak particle velocity as recorded at the designated structures or locations shall not exceed one inch per second. Recording devices shall provide a real-time direct readout permanent record of vibration or airblast measurements and a copy shall be submitted to the COTR. If required, vibration and airblast monitoring shall be done in locations designated by the COTR.

d. MEASUREMENT FOR ATMOSPHERIC STRAY CURRENTS: When electric blasting methods are used, provide a means of adequately measuring for atmospheric stray currents by using approved equipment designed for this purpose.

e. BLASTER CERTIFICATION: Comply with OSHA 1926.900 entitled "Blasting and the Use of Explosives" with regard to the hiring and use of blasting personnel. In states having jurisdiction for enforcement and requirements for formal certification or licensing blasters and explosives purchasers, comply fully with the requirements.

1.4.8 MATERIALS HANDLING AND STORAGE:

a. STORAGE: Storage yards shall be laid out to permit loading and unloading without backing maneuvers. Steel and heavy materials shall be stacked on adequate lagging to prevent shifting. Cylindrical shaped material such as poles and pipe shall be handled with extra caution to prevent unplanned movement from endangering personnel and property. Material arriving on transports shall be examined to determine if additional lagging or additional load securing is necessary to protect personnel engaged in rigging and unloading operations.

b. TAG LINES: Tag lines shall be utilized to maintain control of materials or structures being raised or lowered, except where the use of such lines would create a greater hazard.

c. HANDLINES: Handlines including all hardware and rigging, shall have a minimum safety factor of 3.

d. TOOLS: Tools and materials shall not be thrown or dropped from structures. Handlines and tool bags shall be used.

1.4.9 EQUIPMENT:

a. GENERAL:

(1) Operators: Machinery and mechanized equipment shall be operated only by trained and authorized personnel. Equipment operators shall operate their equipment safely at all times. If requested by the COTR, furnish a copy of the equipment operator's qualification records.

(2) Riding on Equipment: Riding on equipment is prohibited unless a safe place to ride is provided. A safe place to ride is defined as a permanently affixed seat with passenger restraint device. Getting on or off equipment while in motion is prohibited.

(3) Equipment Lockout: Equipment shall be equipped with provision for tagging and locking out the controls while under maintenance, cleaning, and repair. An approved lockout and tagout procedure shall be established, prescribing specific responsibilities and safety procedures to be followed by the persons performing the repair work.

(4) High-voltage Lines (600 volts and greater): Equipment shall not be operated where it is possible to bring such equipment or any part of the equipment within 10 feet of any high-voltage line or installation unless at least one of the following safety precautions has been taken:

(a) Utility company or owner of the line has been notified, the line deenergized and grounded, and positive control measures taken to prevent energization of the line while the work is in progress.

(b) Adequate guards or barriers have been erected or exist to prevent any part of the equipment from approaching closer than clearances listed in OSHA 1926.950 Table V-1 to an energized conductor. These guards or barriers must provide positive prevention of contact and not rely on visual observations.

A notice of the distance limitation shall be posted in the operator's cab of cranes, shovels, backhoes, and related equipment.

(5) Safe Condition: Before initial use on the job of machinery or mechanized equipment, inspect, tested, and Contractor personnel who shall determine that the equipment is in safe operating condition and is appropriate for the intended use. Operators shall be instructed to check their equipment daily, prior to use, and report any deficiencies to management.

(6) Brakes: When directed by the COTR or when otherwise required, carry out a braking performance test on all onsite equipment. Test shall be conducted in the presence of the COTR and a record of the test shall be provided to the COTR.

(7) Walking and Working Surfaces: Ladders, steps, platforms, and walkways on equipment shall be provided with nonslip surfacing material to reduce the possibility of slipping. Nonslip surfaces shall be maintained in safe and effective condition at all times.

b. OPERATOR PROTECTION: Equipment defined by the U.S. Department of Labor Safety and Health Regulations for Construction 29 CFR 1926.1000 manufactured after July 1, 1969, shall be equipped with Rollover Protection Service (ROPS) meeting those standards. Equipment with ROPS or protective frames shall have seat belts that are installed in accordance with SAE Recommended Practice J386. In addition, the following special standards apply to equipment:

(1) Farm and Industrial Tractors: Rubber-tired farm and industrial tractors shall be equipped with protective frames designed and installed to meet or exceed the recommended minimum performance criteria of SAE Standard J334, "Protective Frame Performance Requirements", date of manufacture not withstanding.

(2) Tuggers and Tensioners: Operators of tensioners and tuggers shall be totally protected from contact with bullwheels, cable drums, and tension-line snap back.

c. LIFTING DEVICES:

(1) General: A lifting device is any machine or apparatus used to raise, shift, or lower equipment, materials, or personnel. Devices shall be designed and manufactured or fabricated for their intended use and shall conform to applicable ANSI standards. Definitions contained in OSHA 1910 Subpart N and 1926 Subpart N shall apply.

(2) Mobile Cranes: Crawler, truck, and wheel-mounted cranes shall conform to applicable requirements for design, inspection, construction, testing, maintenance, and operation as prescribed in ANSI B 30 (exception in last sentence of B 30.15-0.1 not withstanding).

(3) Aerial Lifts: Mobile lifting devices used to raise, shift, and lower personnel shall conform to applicable requirements of ANSI A 92.2 (date of manufacture notwithstanding). Work platforms suspended from crane load lines or attached to the elevating platform or forks of powered industrial trucks, loaders, and similar equipment will not be permitted.

(4) Other Mobile Lifting Devices: Fabricated mobile lifting devices such as truck-mounted A-frame, gin poles, and similar equipment shall be designed and constructed incorporating the following safety factors: a minimum safety factor of 5 for chains, standing part or guy cables, boom supports, and other load-carrying boom parts; and a minimum safety factor of 3.5 for all live or running cable reevings including boom-hoist cables, shackles, load lines, hooks, and accessories. Welds on structural members whose failure would result in load drop shall be performed by a certified welder and nondestructively tested to assure adequate strength. Prior to initial use, a written certification from a registered professional engineer, competent in structural analysis, shall be provided to the COTR stating the design capacity of the lifting device and that it meets the requirements of this paragraph.

Subsequent modification or alterations to load-carrying parts will require recertification. Design capacity shall be posted at the operator's station.

(5) Testing: Prior to initial use and following modification, alteration, or repair, load test all hoisting equipment at the job site and in the presence of the COTR. Load test shall involve lifting, swinging, and brake holding a load of at least 100 percent but not more than 110 percent of the load chart rating for a specific configuration and load radius. Configuration, load radius, and test weight shall be chosen to prove the machine's capability and load chart accuracy for its anticipated use. Test load shall not exceed the maximum rated capacity of the machine or any load chart rating which is based on structural limitations. Configuration shall provide a boom angle of at least 30° above the horizontal.

(6) Alteration and Repairs: Repairs shall be in strict compliance with manufacturer's instructions with repairs to structural load carrying parts certified by the manufacturer or a registered professional engineer competent in structural analysis.

d. HELICOPTERS: Helicopter operations shall conform to applicable FFA standards, OSHA 29 CFR 1926.551. Prior to starting an operation, submit a written operations and safety program for review and approval. Program shall include copies of manufacturer's data on aircraft, aircraft airworthiness certificate, qualifications of each pilot and pilot's current license, general flight operations safety requirements, and specific procedures for work operations (e.g., helicopter crane, pulling lines, and other similar operations).

e. SECURING EQUIPMENT: Secure motor vehicles and mechanized equipment when not being used to prevent rollaways, unauthorized operation, or movement of accessories and attachments.

1.4.10 GROUNDS, BONDS, AND OTHER PERSONNEL PROTECTIVE DEVICES:

a. GENERAL: Electrical circuits, equipment and conductors; construction equipment and other conductive apparatus used in proximity of energized facilities shall be considered an electrical hazard to personnel and shall be considered energized until grounded and/or bonded in an approved manner. No work shall be performed on energized equipment and circuits and the following minimum distances shall be maintained.

TABLE 1-3

Voltage range (phase to phase) kilovolts	Minimum working and clear hot stick distance
2.1 to 15	2 ft. 0 in.
15.1 to 35	2 ft. 4 in.
36.1 to 46	2 ft. 6 in.
46.1 to 72.5	3 ft. 0 in.
72.6 to 121	3 ft. 4 in.
138 to 145	3 ft. 6 in.
161 to 169	3 ft. 8 in.
230 to 242	5 ft. 0 in.
345 to 362	7 ft. 0 in.
500 to 552	11 ft. 0 in.
700 to 765	15 ft. 0 in.

b. DEFINITIONS: The following definitions of terms apply to the protection of personnel from electrical shock:

(1) Approved Ground: An approved ground shall be

(a) a station ground mat,

(b) an installed structure ground,

(c) 5/8-inch diameter by 10 foot long copperweld or galvanized-type rod embedded to a depth of at least 8 feet, or

(d) equivalent. Equivalent grounds may be used when the contractor can prove grounding resistance equal to or less than (c) above.

(2) Grounding: Grounding is electrically connecting a conductive object to an approved ground.

(3) Bonding: Bonding is electrically connecting a conductive object to other conductive objects.

(4) Approved Ground and Bond Leads: Approved ground and bond leads shall be a minimum 1/0 AWG extra flexible copper or 3/0 AWG extra flexible aluminum or equivalent. An exception will be ground or bond leads attached to No. 2 AWG structure grounds, which may be No. 1 AWG extra flexible copper or equivalent. The leads shall be constructed with commercial connectors installed in accordance with manufacturer's instructions and shall have a current carrying capacity equal to the capacity of the cable. Leads will normally not exceed 40 feet in length.

(5) Hot Stick Ground Lead Connector: A hot stick ground lead connector is one designed for installation with an insulated fiberglass rod or hot stick. The hot stick may be an integral part of the connector or the connector may be designed for use with a universal or utility type hot stick. Connectors shall be the self-cleaning clamp type.

(6) Drag Chain Ground Lead: A drag chain ground lead is a steel or steel alloy chain securely bolted to the chassis of mobile construction equipment. The chain shall have links at least 1 inch in length and the overall chain length shall be sufficient to provide 1 foot of ground contact when the equipment is not moving. A drag chain is an extremely undependable ground and will be used only when no other ground lead is feasible and equipment grounding is required.

(7) Three Phase Grounded Short: Three phase grounded short means the electrical connection of all three phases of an electrical circuit to a common point and to an approved ground. The electrical connection shall be made with approved ground leads (normally less than 40 feet in length) and hot stick connectors.

(8) Grounded Travelers: Grounded travelers are stringing sheaves or blocks used to make electrical connection to conductors, conductive pulling lines and overhead ground wire. They must be designed and constructed for this purpose. Western encourages the use of grounded travelers that incorporate a separate spring tensioned sheave to provide the contact surface.

(9) Barricades: Barricades are intended to warn adequately trained employees and other knowledgeable personnel to stay away from or out of certain areas. They shall be constructed of high visibility non-conductive weather resistant material such as yellow or orange synthetic fiber rope and be adequately supported so as not to be easily displaced and maintain a height of approximately 42 inches above walking level. They shall be located so as to prevent any person obeying the barricade from contacting conductive objects within the barricade.

(10) Barriers: Barriers are intended to physically prevent children and livestock from entering an area and make the existence of a hazard apparent to all other persons. They shall be at least 60 inches high and supported to prevent displacement. Supports shall be constructed and located so as to not enhance climbing. The barrier shall be located to prevent any person obeying it from contacting conductive objects within the barrier. If constructed of conductive materials, the fence shall be connected to an approved ground near the fence perimeter with an approved ground lead. Signs shall be placed on the barrier and shall be 10 inches x 14 inches in size, visible from all approach directions and read "Danger, High Voltage".

(11) Isolation Platform: An isolation platform is a working or walking surface used to prevent personnel from contacting two conductive objects or one conductive object and ground simultaneously. Isolation platforms shall be constructed of a 2-inch nominal dimension lumber supported on 4-inch nominal dimension sills. When used on wet or soft ground, additional supports will be provided to assure the platform stays above the ground surface. Other materials may be used that provide equivalent protection if approved by Western.

(12) Grounded Work Mat: A grounded work mat is a working or walking surface used to eliminate step potentials in a work area. The mat can be constructed of woven wire fencing or concrete reinforcing mesh and shall be grounded to an approved ground within 10 feet of each end of the mat. Access to the mat will be accomplished with an isolation platform.

c. TESTING AND CERTIFICATION:

(1) Ground Leads: Ground leads including the connectors shall be tested and certified to withstand a fault current of 15,000 amperes for 30 cycles with a voltage drop of 75 volts or less. When No. 1 AWG ground leads are permitted, they shall be tested to withstand a fault current of 12,000 amperes. The testing shall be in accordance with the Bureau of Reclamation Power O&M Bulletin No. 5 and Power Maintenance instruction No. 59 or an approved equivalent test procedure. Ground leads shall be retested and recertified annually.

(2) Grounded Travelers: Grounded travelers that accomplish the electrical connection with conductive impregnation of the neoprene or other nonconductive sheave lining shall be new for work under these specifications or a certification of test for conductive capability shall be provided to the Authorized Representative. Each conductive sheave used for required grounding shall be retested every 90 days after being subjected to a fault current or as directed by Western. Testing shall be adequate to prove no major conductive deterioration from the manufacturer's original rating. Each such sheave or block shall be marked or tagged with an individual number and a test log maintained.

(3) Grounded Travelers: Grounded travelers that incorporate a separate spring tensioned sheave shall be designed and installed to provide 1 ohm or less resistance between the conductor, conductive pulling line, or overhead ground wire and the approved ground. This test can be performed at the worksite in the presence of a Western representative.

1.4.11 CLEARANCES, HOT LINE ORDERS, AND SPECIAL WORK PERMITS:

a. GENERAL: Secure information from the COTR concerning which facilities are energized at or near each worksite, take all necessary precautions for the safety of personnel, and keep employees fully iformed of the work situation, including safe work limits.

b. DEFINITIONS:

(1) Clearance: A procedure whereby energized electrical facilities are deenergized and switches, disconnecting switches, and circuit breakers are tagged or locked to prevent reenergization.

(2) Hot Line Order: A procedure whereby adjacent electrical facilities may remain energized during Contractor operations, but provides that if any circuit breaker connected to the facilities opens under fault conditions, it will not be reclosed until all equipment and employees working in the area are determined to be in the clear.

(3) Special Work Permit: A written permit issued by Western which indicates the limits of the work area, restrictions, and conditions pertinent to the work. It will be issued to the Contractor at the worksite.

c. JURISDICTION: Western's substations and transmission lines are under the jurisdiction of Western's power operation and maintenance staff and are subject at all times to their standard operating procedures and regulations.

Provisions will be made to deenergize only those buses and circuits as necessary to accomplish the work. Such deenergization will be carried out on a progressive, preplanned basis, determined by the progress of construction. Certain operating facilities will be released only at prescheduled times, such as offpeak periods, in order to maintain continuity of commercial electrical service.

d. PROCEDURES TO OBTAIN SPECIAL WORK PERMIT:

(1) A request for a Special Work Permit shall be made in writing at least 10 working days prior to the anticipated work. The request shall include the plan of operation indicating the work to be done, sequence of operations, time to start work, duration of work, number of employees and their classification, safety precautions to be taken, type and location of barricades, warning signs, protective grounds, and description of equipment to be used in performing the work.

(2) Following approval of the Contractor's plan of operation, and after obtaining a Clearance or Hot Line Order, Western's inspector at the jobsite will issue a Special Work Permit to the Contractor's job supervisor.

(3) The Special Work Permit will indicate the limits of the work area, restrictions, and conditions pertinent to the Clearance and/or Hot Line Order. Both the Contractor and Western's inspector at the jobsite, shall sign the Special Work Permit and each retain a copy.

(4) The Contractor shall review the Special Work Permit and limits of the work area with the employees before proceeding with the work, and as frequently thereafter as necessary to ensure that all employees are knowledgeable of the work program and the required safety precautions.

(5) After receipt of a Special Work Permit for a Clearance and prior to commencement of any other work, install personnel protective grounds in accordance with the previously approved plan. Minimum grounding shall include a three-phase grounded short which shall be accomplished under the observation of Western's inspector in the following sequence:

(a) Using a hot stick of sufficient length to maintain the clearance distances contained in Table 1-3 of the "Grounds, Bonds, and Other Personnel Protective Devices" paragraph, feel out the circuit to ascertain it is deenergized.

(b) Install the ground leads by first attaching the leads to the approved ground.

(c) Attach the ground leads to the deenergized circuit with a hot stick maintaining clearances contained in Table 1-3 of the "Grounds, Bonds, and Other Personnel Protective Devices" paragraph until all ground leads are attached. This clearance requirement includes all parts of the ground lead being attached.

Additional grounding may be required depending on the type and location of work being performed. Recent studies by Western and other utilities have disclosed that in order for a ground to provide a shunt for a workman it must be located at or near the worksite in a manner that will prevent ground gradient voltage drops.

e. RELEASE OF SPECIAL WORK PERMIT: After the work has been completed, the Contractor's job supervisor shall advise Western's inspector, and the following shall occur:

(1) Western's inspector will check to determine that the equipment installed or modified is satisfactory for normal service or energization, or is in safe condition for the action to be released.

(2) Contractor shall then remove all grounds, bonds, and other protective devices under the observation of Western's inspector. The three-phase grounded short shall be removed in the reverse sequence of subparagraph d.(5) above.

(3) Contractor's job supervisors holding the Special Work Permit shall sign both copies of the release of the Special Work Permit certifying that all personnel are in the clear and will remain in the clear and that all grounds, bonds, and protective devices have been removed.

f. TRANSFER OF RESPONSIBILITY FOR SPECIAL WORK PERMIT: If necessary to transfer responsibility for work under a Special Work Permit from one Contractor's job supervisor to another, the following shall occur:

(1) A new Special Work Permit will be issued to the new job supervisor by Western's inspector with an explanation of the limits of the work defined thereon.

(2) Western's inspector and the new job supervisor will review the location and integrity of all grounds, bonds, and other protective devices.

(3) The old Special Work Permit may then be released.

1.4.12 TRANSMISSION LINE SAFETY REQUIREMENTS:

a. SUPERVISOR QUALIFICATIONS AND COMPETENCY: The Contractor shall furnish a copy of the supervisor's work history containing the supervisor's background, training, and competency in the work to be performed.

b. ACCESS: Where access to the line right-of-way and downline access road or trail construction is permitted, they shall be built and maintained in a safe condition, including road approaches, filling of ditches, and installation of drainage structures where terrain dictates. In areas where environmental considerations or other restrictions will not permit access road or trail construction or improvement, the Contractor shall alter construction methods and/or furnish and use equipment which will operate safely under existing conditions. Where power or telephone lines parallel a road being crossed, approaches shall be constructed to provide adequate clearance for cranes, aerial lifts, and other equipment.

c. STRUCTURE ERECTION: Procedures for erecting wood, concrete, and steel structures shall be made a part of the safety program. The structure-erection plan shall include, but not be limited to, the following subjects: assembly, lifting, shoring, size and type of hoisting equipment, operator qualifications, crane signal/communication, connecting rigging, guying, moving equipment, and protection for adjacent energized power facilities.

d. CONDUCTOR AND OVERHEAD GROUND WIRE STRINGING: Overhead ground wire and conductive pulling lines shall be considered the same as conductor in terms of required safety precautions during installation.

(1) Contractor's Plan Required: Procedures for the stringing, sagging, and clipping operations shall be made a part of the Safety Program. The plan shall consist of a description of the stringing method proposed and include: the type of stringing equipment to be used; grounding and bonding devices and procedures; barrier and barricade design as applicable; isolation platform design and use; utility, highway, railway and waterway crossing methods including guard structure design; clearances required; copies of manufacturer's certificates and/or certifications required by subparagraph c. of the "Grounds, Bonds, and Other Personnel Protective Devices" paragraph and the determination required by subparagraph h.(1) below.

(2) Miscellaneous: Pulling and braking machines shall be well aligned and firmly anchored against displacement. Operators shall remain at the controls at all times when wire is being pulled. The speed of pull shall not be in excess of that specified by the manufacturer. Tension on the wire shall be maintained as near constant as possible. The pulling and braking machine operators shall be in constant voice communication in order that the operation may be halted immediately in the event of an emergency. Reel jacks shall have ample capacity, operate smoothly, and be equipped with adjustable brakes to control the reels while pulling. Reels shall be firmly attached to the reel jacks and the reel jacks anchored in a manner that will prevent displacement or overturning in the event of a fouled reel or brake lockup while pulling.

Attachment between pulling lines and the conductor being strung shall be of adequate capacity and so constructed to allow the lines to flow freely through the stringing blocks. A designated person in direct communication with the pulling machine operator shall watch such attachment through each structure. The ends of socks shall be taped to ensure against slippage. If a conductor being strung should catch under any firm object, no attempt shall be made to free the conductor until the pulling has been stopped and the tension slacked off.

No person shall be allowed on any structure within the pulling area when conductor or pulling line is being pulled.

Stringing operations shall be terminated when electrical storm activity is present in the area.

e. BARRICADES: A barricade shall be used to enclose the area between the tensioner and reel jacks. Entering the area will be permitted only with the knowledge of the tension and pulling machine operators when all pulling is stopped and undesired tension released.

f. GROUNDING AND BONDING:

(1) All pulling equipment, reels, and tensioning equipment shall be grounded to an approved ground. Only one approved ground shall be used at each site and all equipment at the site shall be bonded together or grounded at a common point.

(2) An approved grounded traveler shall be used at the first structure adjacent to both the pulling and tensioning setup. It shall be bonded to the metal structure or structure ground at or near the conductor level.

(3) During splicing operations at ground level, both conductor ends shall be grounded to a common approved ground using hot stick ground lead connectors. When splicing from an aerial device, the aerial device shall be grounded and the basket or platform shall be bonded to both conductor ends using hot stick ground lead connectors.

(4) When making dead end or tension structure conductor measurements or attachments, or installing jumpers, all conductors shall be bonded to the structure ground using hot stick ground lead connectors. Aerial devices used shall be grounded and the basket or platform bonded to the structure and/or conductor as appropriate.

(5) Aerial workers (e.g., clipping crews) shall place bonds at each structure in a manner that will provide a shunt between any two conductive surfaces they may contact. A hot stick ground lead connector shall be used for this purpose. Aerial devices shall be grounded and the basket or platform bonded to the structure and/or conductor as appropriate.

(6) Permanent construction grounds shall be maintained on each isolated line section and shall remain in place until all aerial work is complete. They shall be progressively removed as part of the final aerial cleanup. Dead end structure jumpers shall generally be left open to isolate line sections and grounds shall not be installed on these structures.

(7) If for any reason work on conductors is required in a manner or sequence that may result in continuity across the open jumpers, except during jumper installation, after removal of the permanent construction grounds, and jumpers installed, a Special Work Permit is required with a three-phase grounded short at the worksite.

g. CROSSING EXISTING CIRCUITS, HIGHWAYS, RAILROADS, AND TELEPHONE LINES: The owner, utility, or authority having jurisdiction shall be notified in advance of making all such crossings and all necessary permits obtained by the contractor. The following safety precautions shall be taken and the procedures followed by the contractor:

(1) Prior to stringing over or under an existing powerline, the contractor shall inform the owner or utility company and request the existing line be deenergized. the contractor shall obtain proper clearances and ground all phase of the deenergized line on both sides of the crossing. In the event the existing line cannot be deenergized and grounded, the contractor shall request the automatic reclosers be made inoperative and a Hot Line Order placed on the existing energized line. The contractor shall be responsible for securing Hot Line Orders and/or Clearances from the respective utility on non-Western lines. Western shall be kept fully informed, in writing, of all such Hot Line Orders and Clearances.

(2) Protective guard structures shall be installed at all crossing. These structures shall be designed and installed to ensure that adequate clearance is continually maintained between the pulling lines or conductors and the facility being crossed. Clearances from energized lines shall be at least 5 feet but never less than the distance in Table 1-3 of subparagraph a. in the "Grounds, Bonds,

and Other Personnel Protective Devices" paragraph for the voltage being crossed. These structures will remain in place until clipping is completed on structures adjacent to the crossing.

(3) Ropes utilized as lead lines at energized crossings shall be nonconductive and shall be kept clean and dry to protect their dielectric strength.

(4) The conductive pulling lines and conductors shall be grounded at each structure adjacent to energized line crossings. This can be accomplished with grounded travelers during stringing operations but prior to removal of grounded travelers for conductor clipping they shall be replaced with hot stick clamp-type grounds. These grounds shall remain until clipping is completed on structures adjacent to the crossing.

(5) All hot line, highway, and railroad crossings shall be attended when wire is being pulled. Each attendant shall be provided a means of direct communication with the pulling machine operator.

(6) A barricade shall be used to enclose all equipment at the pulling site while threading lead lines and pulling lines. Access to the equipment shall be accomplished with an isolation platform. Entering the barricaded area shall not be permitted without permission of the stringing supervisor.

h. STRINGING ADJACENT TO ENERGIZED LINES: In addition to the above requirements, the following shall apply when stringing adjacent to the energized lines:

(1) General: Induced voltage in transmission line conductors and pulling lines due to electrostatic and electromagnetic coupling with adjacent energized lines is a recognized hazard with extreme injury potential. Therefore, additional precautions must be taken when stringing under these conditions to provide a safe working environment. Western has made a preliminary review and identified the line reaches shown in Table 1-1 of subparagraph d. in the "Description of Work" paragraph as having the potential for developing dangerous voltage levels under certain loading, surging and/or fault conditions on the energized line. The contractor shall make a final jobsite review prior to stringing to define additional adjacent facilities that may have been omitted from Table 1-1 of subparagraph d. in the "Description of Work" paragraph.

The Contractor shall incorporate, in the Safety Program, the results of his final review and precautions that will be taken in all areas identified. Precautions shall include requesting and receiving a clearance from the utility controlling the adjacent energized circuit or implementing the requirements of OSHA 1926.955(d), subparagraph (2) and (3) below. The precautions contained herein are not all-inclusive

depending on the actual stringing procedures and equipment utilized. Contractor shall evaluate work procedures to assure that employees are not exposed to hazardous induce voltages and/or step or touch potential.

Precautions shall be continued beyond the identified areas until the conductor being strung can be isolated by open jumpers or a dead end structure.

(2) Barriers and Barricades:

(a) A barrier shall enclose all equipment at the pulling and tensioning sites with access to the equipment accomplished with isolation platforms. If left unattended, with conductors or conductive pulling lines in the travelers, access points to the equipment shall be closed.

(b) A barrier shall enclose catchoff points and unattended conductor tails. Employees making catchoff connections and sag adjustments shall work from isolation platforms or grounded working mats.

(c) Conductor tails, when laid out, shall be placed on isolation platforms or grounded working mats and barricades utilized to prevent access except at the splice location.

(d) Aerial lifts used for splicing or clipping shall be barricaded and an isolation platform used for access to the equipment.

i. GROUNDS AND BONDS: Approved grounds utilized to ground equipment and conductors inside of a barrier or barricade shall be located inside and at least 10 feet from the perimeter of the barrier or barricade.

SECTION 1.5--ENVIRONMENTAL QUALITY PROTECTION

1.5.1 ENVIRONMENTAL REQUIREMENTS:

Comply with all Federal, State, and local environmental laws, orders and regulations. The Contract Clauses prescribe environmental requirements and the paragraphs in this Subdivision specify further measures to be followed in the performance of the work.

1.5.2 LANDSCAPE PRESERVATION:

a. GENERAL: Preserve the landscape in accordance with the Contract Clause entitled "Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements". Except where clearing is required for permanent works, approved construction roads, and excavation operations, all trees, native shrubbery, and vegetation shall be preserved and shall be protected from damage by the Contractor's construction operations and

equipment. Except as otherwise provided in the Clearing Subdivision of these specifications, the edges of clearings and cuts through trees, shrubbery, and vegetation shall be irregularly shaped to soften the undesirable visual impact of straight lines. Movement of crews and equipment within the right-of-way and over routes provided for access to the work shall be performed in a manner to prevent damage to grazing land, crops, and property.

Special reseeding or replanting will not be required under these specifications; however, on completion of the work, all work areas shall be scarified or left in a condition which will facilitate natural revegetation, provide for proper drainage, and prevent erosion. All destruction, scarring, damage, and defacing of the landscape resulting from the Contractor's operations shall be repaired by the Contractor as directed by the COTR.

b. CONSTRUCTION ROADS: Location, alignment, and grade of construction roads shall be subject to the COTR's approval. When no longer required, construction roads shall be restored to the "original" contour and made impassable to vehicular traffic. Surfaces of construction roads shall be scarified as needed to provide a condition which will facilitate natural revegetation, provide for proper drainage, and prevent erosion.

c. CONSTRUCTION FACILITIES: Shop, office, and yard areas shall be located and arranged to preserve trees and vegetation to the maximum practicable extent. On abandonment, storage and construction buildings, including concrete footings and slabs, and all construction materials and debris shall be removed from the site. The area shall be regraded as required so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate natural revegetation, provide for proper drainage, and prevent erosion.

1.5.3 PREVENTION OF WATER POLLUTION:

a. GENERAL: Construction activities shall be performed by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris, and other objectionable pollutants and wastes into streams, flowing or dry watercourses, lakes, and underground water sources. Such pollutants and wastes include, but are not restricted to, excavated materials, refuse, garbage, cement, concrete, sanitary waste, industrial waste, radioactive substances, oil and other petroleum products, aggregate processing tailings, mineral salts, and thermal pollution.

b. EXCAVATED MATERIALS: Excavated material or other construction materials shall not be stockpiled or deposited near or on streambanks, lake shorelines, and other watercourse perimeters where they can be washed away by high water or storm runoff or can in any way encroach upon the actual watercourse itself.

c. STREAM CROSSINGS: Stream crossing shall be done in an approved manner. Muddy Creek and Teton River shall not be crossed with any vehicle. Crossing of certain other streams may not be possible.

1.5.4 ABATEMENT OF AIR POLLUTION:

a. GENERAL: Construction activities and operation of equipment shall utilize such practicable methods and devices as are available to control, prevent, and otherwise minimize emissions or discharges of air contaminants.

b. EMISSION OF DUST: Emission of dust into the atmosphere will not be permitted during manufacture, handling, and storage of concrete aggregates, and the Contractor shall use such methods and equipment as are necessary for the collection and disposal, or prevention, of dust during these operations. Methods of storing and handling cement and pozzolans shall include means of eliminating discharges of dust into the air. Dust nuisance resulting from construction activities shall be prevented in accordance with subparagraph d. below.

c. EQUIPMENT AND VEHICLE EMISSIONS: Equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, shall not be operated until corrective repairs or adjustments are made.

d. DUST ABATEMENT: Dust nuisance resulting from construction activities shall be prevented by periodic watering of disturbed soils on access and haul roads. Oil and other petroleum derivatives shall not be used for dust control.

1.5.5 PRESERVATION OF CULTURAL RESOURCES AND DATA:

a. GENERAL: Federal legislation provides for protection, preservation, and collection of scientific, prehistorical, historical, and archeological data, including bones, relics, and specimens, which might otherwise be lost due to alteration of the terrain during Federal construction projects.

b. KNOWN CULTURAL SITES: Following issuance of notice to proceed, Western will provide two sets of Plan and Profile drawings showing all known significant historical or archeological sites located on or immediately adjacent to the transmission line right-of-way. These sites shall be considered avoidance areas. Prior to any construction activity, mark the avoidance areas on the ground in an approved manner. Contractor shall instruct his employees, subcontractors, and others that vehicular or equipment access to these areas is prohibited. If access is absolutely necessary, first obtain approval from the COTR. Ground markings shall be maintained throughout the duration of the contract. Western will remove the markings during or following final cleanup.

c. UNKNOWN CULTURAL SITES:

(1) Reporting: If evidence of possible scientific, prehistorical, historical, or archeological data, is discovered, notify the COTR immediately and give the location and nature of the findings. Forward written confirmation within two days. Stop all activities within a 50-foot radius of the discovery site and do not proceed with work activities at the site until directed to proceed by the COTR.

(2) Care of Evidence: Do not damage artifacts or fossils uncovered during construction operations. Provide such cooperation and assistance as may be necessary to preserve the findings for removal or disposition by Western.

d. CONTRACT ADJUSTMENTS: Where appropriate by reason of a discovery, the Contracting Officer may order an extension in contract completion, changes in the work, or both.

e. SUBCONTRACTS: Insert this paragraph in all subcontracts which involve work on the terrain of the sites.

1.5.6 DISPOSAL OF WASTE MATERIALS:

a. GENERAL: In addition to the requirements of the Contract Clause entitled "Cleaning Up", remove from the right-of-way all waste materials including trees, refuse, garbage, sanitary wastes, industrial wastes, and oil and other petroleum products. Burning or burying of waste materials on the right-of-way will not be permitted. All materials resulting from clearing operations shall be removed from the right-of-way.

b. REMOVING WASTE MATERIALS: Remove all waste material from the right-of-way prior to contract completion. Materials to be disposed of by dumping shall be hauled to an approved dump. Make all necessary arrangements with private parties and with local officials pertinent to locations and regulations of dumping.

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DIVISION 2 - SITEWORK

SUBDIVISION 2.1--SITE DRAINAGE

2.1.1 CORRUGATED METAL PIPE CULVERTS:

a. GENERAL: The Section B items "Corrugated metal pipe culverts, 18-inch diameter", "Corrugated metal pipe culverts, 24-inch diameter", and "Corrugated metal pipe culverts, 30-inch diameter" include furnishing and installing the pipe culverts and constructing necessary fill over the pipe culverts.

b. MATERIALS: Corrugated iron or steel pipe, including coupling bands, shall be in accordance with Federal Specification WW-P-405, 16-gage, Class I or II, Shape 1. The Contractor may furnish corrugated aluminum alloy pipe and coupling bands in lieu of corrugated-iron or steel pipe. Aluminum alloy pipe shall be in accordance with Federal Specification WW-P-402, 16-gage, Class I or II, Shape 1.

c. EXCAVATION: The ditches in which the corrugated metal-pipe culverts are to be laid shall be carefully finished to the existing ditch flow lines and grades so that the pipe will be fully supported at all points by unexcavated ground under the bottom quarter of the circumference.

If the character of the material at any point in the bottom of a culvert ditch is such as might cause unequal settlement or provide unequal bearing for the pipe, or is otherwise unsuitable for a foundation for the pipe, the unsatisfactory materials shall be removed to such depths as may be directed by the COTR. Additional excavation required on account of encountering unsuitable material in the bottom of a culvert ditch shall be backfilled and the backfill compacted. Backfill material in the bottom of trenches where additional excavation has been required shall be carefully shaped to fit the curvature of the pipe under the bottom quarter of its circumference. Additional excavation and placing and compacting backfill required on account of encountering unsuitable material in the bottom of a culvert ditch will be paid for in accordance with the Contract Clause "Changes".

Fill material shall not be obtained on the right-of-way but shall be obtained from an approved source. Location, culvert size, and approximate length and depth of fill are as follows:

Approximate station	Culvert Size and Length	Approximate Depth and Length of Fill
428+00	30" X 30'	5' X 50' (off-ROW Access)
468+00	24" X 30'	5' X 50' (off-ROW Access)
502+00	24" X 30'	5' X 80' (off-ROW Access)
511+30	18" X 18'	2' X 30'
557+95	18" X 18'	2' X 30'
614+44	18" X 24'	4' X 50'
733+00	18' X 18'	2' X 30'
1192+90	24" X 18'	2' X 30'
1326+49	24" X 18'	2' X 30'
1356+00	24" X 18'	2' X 30' (off-ROW Access)
1688+40	24" X 18'	2' X 40' (off-ROW Access)
1741+75	24" X 24'	4' X 50'
2092+70	24" X 18'	2' X 30'
2339+49	24" X 18'	2' X 20'
2367+55	24" X 18'	2' X 30'
2430+24	24" X 18'	2' X 30'
2460+80	24" X 18'	2' X 100' (off-ROW Access)
2476+11	24" X 18'	3' X 30'
3376+50	18" X 18'	2' X 10'
3399+56	18" X 18'	2' X 10'
3408+21	18" X 18'	2' X 10'
3428+69	24" X 18'	3' X 20'

d. COMPACTING EARTH MATERIALS:

(1) General: Where compacting of earth materials is required, the materials shall be deposited in horizontal layers and compacted as specified in this subparagraph.

Excavation, placing, moistening, and compacting operations shall be such that the material will be uniformly compacted throughout the required section and shall be homogeneous, free of lenses, pockets, streaks, laminations, or other imperfections.

(2) Compacting Clayey and Silty Materials: Where compaction of earth materials containing appreciable amounts of clay or silt is required, the materials shall be deposited in horizontal layers. The thickness of each horizontal layer after compaction shall be not more than 6 inches.

Excavating and placing operations shall be such that the materials, when compacted, will be blended sufficiently to secure the highest practicable unit weight and best impermeability and stability.

Prior to and during compaction operations, the materials shall have a moisture content of not greater than 3 percent wet or less than 3 percent dry of optimum moisture, as determined by the COTR and the moisture content shall be uniform throughout each layer.

When the material has been conditioned as hereinbefore specified, it shall be compacted by rollers or by hand or power tampers. Where hand or power tampers are used to compact soils in confined areas such as under pipes, they shall be equipped with suitably shaped heads to obtain the required density.

The density (dry) of the soil fraction in the compacted material shall not be less than 92 percent of the laboratory standard maximum soil density (dry) as determined by the Bureau of Reclamation Proctor Compaction Test for the materials being compacted.

The Bureau of Reclamation Proctor Compaction Test will be made by Western. The standard maximum soil density is the dry weight per cubic foot of the soil compacted at optimum moisture content by laboratory procedure. The compaction test is the same as ASTM D 698, Method A, except that a 1/20-cubic-foot compaction mold is used and the rammer is dropped from a height of 18 inches, resulting in the same energy of compaction per unit volume.

(3) Compacting Cohesionless Materials: The thickness of the horizontal layers after compaction shall not be more than 6 inches if compaction is performed by tampers or rollers; not more than 12 inches if compaction is performed by treads of crawler-type tractors, surface vibrators, or similar equipment; and not more than the penetrating depth of the vibrator if compaction is performed by internal vibrators. Water shall be added to the materials as may be required to obtain the specified density by method of compaction being used.

The relative density of the compacted material shall be not less than 70 percent as determined by ASTM D 2049.

(4) Nuclear Density Gauges: At the option of Western nuclear density gauges may be used to determine the soil moisture content and degree of compaction.

e. HAULING AND HANDLING: The pipe shall be hauled and handled in such a manner as to avoid damage to the galvanized coating. Cable or chain slings shall not be used for handling the pipe.

Damage to galvanized coating shall be repaired by applying two coats of zinc dust-zinc oxide paint conforming to Federal Specification TT-P-641, Type II. If the COTR determines a pipe unit is damaged beyond repair in hauling, handling, or otherwise, it shall be replaced and removed from the work site.

f. LAYING: Corrugated metal pipe shall be laid to the finished lines and grades or depths established by the COTR. Fastenings shall be drawn up tight. Pipe shall be carefully placed so as to be fully supported at all points over the bottom quarter of the circumference. Coupling bands shall be used where necessary to join sections of pipe. Coupling bands shall be installed in a manner to insure tight joints, with the joints between sections approximately at the center of the couplings.

As each unit of pipe is laid, sufficient backfill material shall be tamped about the pipe to hold it rigidly in place until the joints are completed. After the joints have been completed, backfill shall be placed and compacted. Equipment travel over the pipe shall not be permitted until backfill has been placed and compacted to the depth recommended by the pipe manufacturer, but not less than 1 foot above the top of the pipe.

g. QUANTITIES AND PAYMENT: The length and diameter of each culvert shall be as specified in subparagraph c. and payment will be made only on these lengths and diameters.

Where additional sizes are required by the COTR, payment for furnishing and installing the additional culverts will be made in accordance with the Contract Clause "Changes".

SUBDIVISION 2.2--FENCING

2.2.1 PERMANENT GATES IN EXISTING FENCES:

a. GENERAL: The Section B items "Barbed wire gates on right-of-way" and "Barbed wire gates off right-of-way" provides barbed wire gates in existing fences.

b. MATERIALS: Material for the fence gates shall be in accordance with the details shown on the drawings and as follows:

(1) Barbed Wire Gates for Right-of-way Fences: As shown on drawing 23 (41 9002).

(2) Barbed Wire Gates for Off Right-of-way Fences: As shown on drawing 27 (41 9020).

(3) Barbed Wire Gate Closers: Furnished by Western.

c. INSTALLATION: The gates, including closers, shall be installed in existing fences where directed by the COTR.

2.2.2 FENCE GROUNDS:

a. GENERAL: The Section B item "Fence grounds for non-electric fences" includes grounding all fences of metallic material which cross under the transmission line or which are located in the proximity of and parallel to the transmission line as described below except for locations at which fence grounds have been previously furnished and installed by others.

Nonelectric fences which are constructed on wood or concrete posts, and all electric fences, shall be grounded with one grounding rod at the hinge end of each gate and one grounding rod for each 1/8 mile of the fences that are parallel to and within 150 feet of the centerline of the transmission line. One grounding rod shall be used on each side of the right-of-way to ground fences crossing under the line.

Nonelectric fences which are constructed on metal posts, either driven or set in concrete, shall be grounded with one grounding rod for each 1/4 mile of the fences that are parallel to and within 150 feet of the centerline of the transmission line. One grounding rod shall be used on each side of the right-of-way to ground fences crossing under the line.

All metallic gates within the right-of-way shall be bonded electrically to the fences.

b. MATERIALS: Materials utilized in grounding fences shall be in accordance with drawing 21 (41 1011).

c. INSTALLATION: Fence grounds shall be installed in accordance with drawing 21 (41 1011). Grounding rods shall be driven to a depth of not less than 5 feet. The fence wires shall be fastened securely to the grounding rods by U-bolt clamps.

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DIVISION 3 - STEEL OR CONCRETE POLES

SUBDIVISION 3.1--STEEL OR CONCRETE POLE STRUCTURES

3.1.1 GENERAL:

The Section B items "Steel or concrete pole structures as follows" includes designing, detailing, furnishing, and installing, or erecting materials, parts, and accessories required for the complete installation of the pole structures.

Davit arms, connecting bolts, nuts, locknuts, climbing and ground wire clips, inserts, guys, guy hardware, guy anchors, standard concrete backfill including reinforcement, structure grounding, signs, and other appurtenances including fixed climbing provisions shall be considered as part of the pole structure for which they are required and included in the appropriate unit price per pole bid therefore in Section B.

All pole structures shall conform to the requirements of this Division. All poles of one material or any combination of galvanized steel and concrete may be furnished.

All steel components shall conform to the requirements of the "Steel Pole Structures" Subdivision, and all concrete components shall conform to the requirements of the "Concrete Pole Structures" Subdivision.

The Section B item "Spare davit arms" includes furnishing and delivering 6 upper davit arms and 12 lower davit arms for the Type 28X pole structure, complete with mounting hardware. Spare davit arms and hardware shall be delivered to Western's Havre Substation located near Havre, Montana, and stored as directed by the COTR.

The Section B item "Extra concrete backfill for steel poles" includes furnishing and placing extra concrete backfill for steel poles in accordance with subparagraph 3.2.1.d.(1)(b).

Measurement for payment for extra concrete backfill shall be on a per pole basis.

The Section B item "Rock backfill for concrete poles" includes furnishing, placing, and compacting rock backfill for concrete poles in accordance with subparagraph 3.3.1.e.(1)(b).

Measurement for payment for rock backfill shall be on a per pole basis.

Due to possible saline seepage, between stations 2670+00 and 2790+00, steel or concrete type shall be backfilled with concrete Type V cement. The concrete for the above area shall include an additive to prevent concrete shrinkage. The additive shall be subject to approval by the COTR.

3.1.2 CONTRACTOR-FURNISHED DRAWINGS AND DATA:

a. GENERAL: Furnish drawings and data as specified for all pole structures required by these specifications.

Make changes in drawings, designs, or construction details which Western determines necessary to make the finished construction conform to these specifications and shall revise the drawings to reflect any changes without additional cost to Western.

Fabrication performed prior to approval of the drawings and data shall be at the Contractor's risk. The time allowed for approval of drawings and data submitted to Western shall be as provided in the "Commencement, Prosecution, and Completion of Work" paragraph.

Western approval of the Contractor's drawings and data shall not relieve the Contractor of his obligation to meet all specification requirements or of his responsibility for the correctness of their drawings. One print of each drawing or data will be returned to the Contractor marked to indicate required changes, if any, and whether the drawing or data is or is not approved.

Units of measurement for the data and drawings shall be in United States standard units and wording, signs, and symbols shall be in English.

Drawings shall be thoroughly checked for accuracy and completeness before being submitted. Western will not check details and intermediate dimensions.

b. DESIGN CALCULATIONS AND DATA: The Contractor shall submit to Western, in triplicate, within 30 calendar days after date of receipt of initial notice to proceed, the following design calculations and data for each type and height of pole structure:

(1) General dimensions and weight.

(2) The total ultimate loads and moments and the ultimate moment capacity at the groundline, splices, joints, other critical points, and at points where reinforcing steel continuity or plate size is changed. Also, groundline shears and axial loads and all other structure design data required for the guy and pole embedment design. The accuracy and correctness of the design of the structures and their components, including guys and their anchors, based on the loads indicated on the drawings, is the sole responsibility of the Contractor.

(3) Maximum deflection at top of structure for the loading cases specified on the drawings.

(4) Embedment calculations.

(5) Cambering calculations and data, if required.

(6) Guy location, ultimate load, size, and capacity.

(7) Type and capacity of guy anchors.

(8) Certification that the manufacturer of the poles has:

(a) Successfully designed and manufactured similar items of comparable magnitude and purpose to those to be furnished under these specifications for a period of not less than 3 years.

(b) Manufacturing facilities adequate for manufacturing the type and size of poles to be furnished.

c. STEEL POLE APPROVAL DRAWINGS: Prior to fabrication of the material, the Contractor shall submit, in triplicate, and obtain Western's approval of the following:

(1) Shop detail drawings showing dimensions and details of all members and connections for each type and height of steel pole structure.

(2) Erection drawings showing the following information on each drawing, where applicable, for each type and height of steel pole structure:

(a) The marking and position of each member in the structure.

(b) A complete bill of material, listing all material for one structure or the portion of the structure shown thereon. The bill of material shall show the number of pieces required in the structure; the description of each piece including size and length; the mark number of each piece; the weight of each piece; and the drawing number on which the shop detail of each piece can be found. The total weight of one complete structure shall be noted on the drawing. All weights shall be calculated in accordance with the latest edition of the AISC "Code of Standard Practice for Steel Buildings and Bridges," except that the calculated weights for shapes other than rectangular shall be based on the actual detailed dimensions shown on the final shop drawings.

(c) Weight, center of gravity, and lifting point of each component.

(d) Pole embedment details, including auger diameter and lengths.

(e) Camber requirements, where applicable.

(f) Guy pretension, if required.

(g) Guy location, arrangement, and attachment details.

(h) Guy anchor and installation details.

(3) Drawings shall show the following:

(a) Specifications number and bid item number.

(b) Job title and reference drawing number.

(c) Type and grade of material and type of finish for the structure.

d. CONCRETE POLE APPROVAL DRAWINGS: Prior to fabrication of the material, the Contractor shall submit, in triplicate, and obtain Western's approval of the following:

(1) Shop detail drawings showing the following information for each type and height of pole:

(a) Dimensions.

(b) Description, yield strength, and location of reinforcement.

(c) Twenty-eight day strength of concrete and detension strength.

(d) All necessary stressing information.

(e) Size, description, quantity, and location of all holes, inserts, and hardware that are a part of the structure.

(f) Weight and location of center of gravity of structure.

(g) Location and method of permanently marking pick-up points and storage points.

(h) Pole identification plate location.

(i) The ultimate groundline moment.

(j) Any other special information.

(2) Each erection drawing showing the following information, where applicable, for each type and height of pole:

(a) Dimensions.

(b) Groundline moment.

(c) Weight.

(d) Center of gravity and lifting points.

(e) The marking and position of each structure member and number and size of bolts for each joint.

(f) Pole embedment details.

(g) Guy pretension, if required.

(h) Guy location, arrangement, and attachment details.

(i) Guy anchor and installation details.

(3) Drawings shall show the following:

(a) Specifications number and bid item number.

(b) Job title and reference drawing number.

(c) Type and grade of material and type of finish for all steel components and bolts.

e. FINAL REPRODUCTIONS: Prior to shipment of materials, furnish reproductions of all drawings required in subparagraph c. or d. above. The drawings shall show all changes and revisions, with revision dates, made up to the time the materials are ready for shipment.

f. FINAL ORIGINAL DRAWINGS: Before final payment is made under the contract, the Contractor shall deliver to Western the drawing originals required in subparagraph c. or d. above, with such additional revisions as may be necessary to correct errors or reflect changes discovered during field erection.

g. DISTRIBUTION OF DRAWINGS:

(1) Design calculations, data, and approval drawings shall be forwarded to Western Area Power Administration, ATTN: Code A2200, P.O. Box 3402, Golden, CO 80401. In addition, the Contractor shall forward a copy of his transmittal letter to the COTR.

(2) Final reproductions shall be forwarded as follows:

(a) One set of positive reproducibles and two sets of prints to the COTR.

(b) One set of prints and a copy of the Contractor's transmittal letter to the COTR shall be sent to the Golden, CO address.

(3) Final original drawings shall be forwarded by insured mail to the Golden, CO address.

h. RIGHT TO USE CONTRACTOR'S DRAWINGS: Drawings submitted hereunder by the Contractor, whether copyrighted or not, Western expressly reserves the right to use; to reproduce in whole or in part; to distribute; to reuse any and all such drawings in connection with the installation, maintenance,

replacement, and repair of the materials furnished under these specifications, and to make any and all such drawings and reproductions available to subsequent bidders and contractors, where necessary, in connection with fabricating and furnishing materials duplicate or similar to the materials furnished hereunder. The depositing of drawings with Western shall constitute a license to Western to use them in the manner herein stated.

SUBDIVISION 3.2--STEEL POLE STRUCTURES

3.2.1 DESIGN REQUIREMENTS:

a. GENERAL: The design shall be made using published theories accepted by the industry as good engineering practice. The structures shall be designed so that the ultimate unit stresses do not exceed the requirements indicated on the drawings, including proper modifications to accommodate allowances for buckling and deflection (secondary bending) and guy loads, where applicable, resulting from treating the guys as elastic members. The unit stresses shall be checked for each loading condition called for on the drawings.

b. DESIGN AIDS: Suggested design aids are as follows:

(1) ASCE 1978 publication "Design of Steel Transmission Pole Structures."

(2) Latest edition of the AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings."

(3) Latest edition of the AWS "Structural Welding Code," D1.1.

c. SPECIAL DESIGN REQUIREMENTS: Steel pole structures shall be designed consistent with the following:

(1) Pole shafts shall be closed shapes.

(2) Poles shall be tapered consistent with strength requirements.

(3) Davit arms and braces may be open or closed shapes.

(4) Davit arms for Types 28L and 28S poles shall be identical to davit arms for Type 28X poles.

(5) Bolted connections will be permitted to attach davit arms, braces, insulators, and similiar components.

(6) Nonguyed angle and tension structures shall be cambered so that the axis of the pole is vertical after the conductors are strung. Camber less than 6 inches will not be required. Camber loads shall be supplied by Western.

(7) Poles shall be sealed or capped at the top to prevent moisture from entering the cavity.

(8) Structural material shall not be less than 3/16-inch thick.

(9) Slip Splices: Sections joined by friction (telescoping) splices shall be detailed for a minimum lap of 1.5 times the largest inside diameter of the female section with allowances for fabrication tolerances. Complete penetration welds shall be used in the female splice area.

(10) Attachments and similar details shown on Western outline drawings may be modified slightly to conform with Contractor's standard practice. Attachment and similar details not shown on the Western outline drawings shall be determined by the Contractor based on the intended use or manufacturer's recommendations.

(11) Holes shall be positioned within the tolerances specified in the "Quality Control" paragraph. Bolts shall be of sufficient strength to develop the ultimate loads shown on the Western design load or Contractor-furnished design drawings.

(12) The pole sections shall have lifting lugs or other approved devices to prevent slippage of slings and insure safe lifting and handling.

d. EMBEDMENT DESIGN: Auger diameter and structure embedment shall be as follows:

(1) Auger Diameter:

(a) Standard Concrete Backfill: When Standard Penetration Test results of the soil are greater than eight blows per foot for the entire excavation below 5 feet as determined by actual tests from the geologic logs or by observation of the excavated material by the COTR, the auger diameter shall provide a minimum clear distance of 6 inches on all sides of the steel pole to receive concrete backfill.

(b) Extra Concrete Backfill: When Standard Penetration Test results of the soil are eight blows per foot or less for any portion of the excavation below 5 feet as determined by actual tests from the geologic logs or by observation of the excavated material by the COTR, the auger diameter shall provide a minimum clear distance of 1 foot 6 inches $\pm$3 inches on all sides of the steel pole to receive concrete backfill.

(2) Embedment Length: The pole embedment length "E" (in feet) shall be:

$$E = L/10.0 + 4.0$$

where L = Total Pole Height above Groundline (in feet).

3.2.2 MATERIALS:

a. STRUCTURAL STEEL: High-strength steel, ASTM A 572 modified, or equivalent, provided the maximum yield point shall not exceed 65 ksi. All material shall have a minimum longitudinal impact strength of 15 foot-pounds at minus 20°F as determined by the Charpy "V" Notch Impact test in accordance with ASTM A 673.

b. DAVIT ARMS: ASTM A 36 or A 572.

c. BOLTS, NUTS, AND WASHERS: Bolts, nuts, and washers shall comply with the requirements of an accepted authority such as ASTM.

d. ARC-WELDING ELECTRODES: Arc-welding electrodes shall be in accordance with the latest edition of AWS "Specifications for Iron and Steel Arc-Welding Electrodes" and shall be suitable for the base materials, positions, and other conditions of intended use.

e. BACKFILL CONCRETE: Concrete required for backfilling shall be in accordance with the following:

(1) Ready-Mix Concrete: Shall conform to ASTM C 94, Alternative No. 2. Concrete shall have a minimum compression strength, f'c, of 3000 psi at 28 days. Furnish the COTR the information listed in 5.3.2 of ASTM C 94.

(2) Admixtures: Air-entraining admixture shall be used in such amounts as will effect the entrainment of 4 to 6 percent air by volume.

(3) Slump: Shall be 3 inches plus or minus 1 inch at time of placement.

(4) Welded Steel Wire Fabric: Shall conform to ASTM A 185 or A 497.

(5) Wax-Base Curing Compound: Shall conform to ASTM C 309, Type 2, Class A.

(6) Clear Resin-Base Curing Compound: Shall conform to ASTM C 309, Type 1, Class B.

3.2.3 QUALITY CONTROL:

a. GENERAL: Contractor shall have quality control methods and functions clearly defined and available for review and approval. Contractor shall maintain permament records of all pertinent information of all component parts such as material specifications, mill test reports, welding procedures, welder's and tacker's identification and qualifications, types of inspections, inspector's test results, and records of all visual and nondestructive testing.

Quality control functions shall include review of all materials, mill test reports for material compliance, material suppliers for their manufacturing procedures, and welding electrode materials. Component parts and welds shall be inspected to determine conformance to drawings, procedures, overall workmanship, weld contour, weld size, and any other pertinent items. Component parts shall be inspected for dimensional compliance. Mating parts shall be matchmarked.

b. WORKMANSHIP AND DEFECTIVE MATERIALS: Work shall be equal to the best modern practice in the manufacture and fabrication of materials of the types covered by these specifications, notwithstanding any omissions from these specifications or drawings. The Contractor shall be responsible for the correct fitting of parts. Replace, free of cost to Western, any defective materials discovered during erection, and pay costs of the correction of any errors not previously discovered.

c. INSPECTION AND TESTS: Inspection of materials will be made in accordance with the "Materials Furnished by the Contractor" paragraph of the "General Requirements" Division. Inspection and tests of materials by Western at the mill is waived. As soon as practicable after receipt of notice of contract award, submit to Western as designated below, a certified copy of each report of the chemical analyses and physical tests of structural steel and bolts, and of chemical analyses and coating test of the galvanizing. The certified mill test reports for steel shapes and plates shall designate the customer's order and mill order numbers and the specifications number. The mill certification shall show the weights of steel furnished for each size and heat number represented by the tests. No material shall be shipped until certified copies of reports of tests and analyses have been received.

The cost of making all chemical analyses and physical tests and of furnishing the certified copies of reports of tests and analyses shall be borne by the Contractor.

Mailing Address: Western Area Power Administration
Attention: A2600
P.O. Box 3402
Golden, CO 80401

d. DIMENSIONAL TOLERANCES:

(1) Length of single pole section -1 inch, +3 inches.

(2) Cross section of poles: 36 inches or less diameter -1/8 inch, +1/4 inch; greater than 36 inches -1/4 inch +1/2 inch circumference of all poles -0 inch.

(3) Spacing between attachment points vertically $\pm$3/4 inch.

(4) Location of hardware with respect to top of pole $\pm$2 inches.

(5) Camber ±1 inch per 16 inches of specified camber.

(6) Straightness of pole 1/8 inch in 10 feet of length.

(7) Location of a drilled hole in a piece ±1/16 inch.

(8) Spacing between holes: Same connection ±1/16 inch (non-accumulative).

3.2.4 NONDESTRUCTIVE TESTING OF WELDS:

a. GENERAL: The Contractor shall inspect and test welds. Tests shall be completed as the work progresses, in the presence of a Western inspector and in accordance with the latest edition of the AWS "Structural Welding Code," D1.1. When welds are found to be defective by the standards of the code, repair the welds in accordance with the Code and reexamine the welds to insure the repair adequacy.

b. VISUAL INSPECTION: Completed welds shall be visually inspected, following the procedures, techniques, and standards of AWS D1.1.

c. ULTRASONIC AND RADIOGRAPHIC TESTING: Perform ultrasonic or radiographic testing of the entire length of all complete joint penetration welds. Perform ultrasonic or radiographic inspection of random longitudinal seams to assure that no cracking or gross lack of penetration exists. This inspection shall cover a minimum of 10 percent of such welds.

d. MAGNETIC PARTICLE AND DYE PENETRANT: The COTR may require magnetic particle or dye penetrant testing of any weldment where the appearance or the configuration suggests a possibility of cracking. The technique and procedure for magnetic particle testing shall be in accordance with ASTM E 109. The technique and procedures for dye penetrant testing shall be in accordance with ASTM E 165. The standards of acceptance shall be in accordance with AWS D1.1. The Contractor shall perform any such testing and shall repair any cracks or other defects discovered.

3.2.5 FABRICATION:

a. GENERAL: Structural steel shall be fabricated in accordance with the following requirements.

Details of design or fabrication not covered by the drawings or by these specifications shall conform to the applicable provisions of the latest AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings," including all supplementary provisions. Web plates of built-up members shall be edge planed or flame-cut with mechanically guided torches and ground smooth. Web plates shall be square and true after the above operation. The Contractor may elect to flame-cut and grind the edges of web plates wherever edge planing is shown or noted on the drawings.

b. STRAIGHTENING MATERIAL: Before being laid out or worked in any manner, structural material shall be straight and free from sharp kinks and bends and shall be clean of rust and dirt. If straightening is necessary, it shall be done by methods that will not damage the metal.

c. SHEARING AND CUTTING: Shearing and cutting shall be finished neatly. Copes and re-entrant cuts shall be filleted before cutting.

d. HOLES: Holes, other than those shown on the steel structure drawings, will not be permitted unless approved by Western. Holes in structural steel less than 13/16 inch thick may be punched to full size unless otherwise noted on the drawings. Holes shown on the drawings as drilled holes and all holes in structural steel 13/16-inch or more in thickness shall be drilled or subpunched and reamed. Holes shall be clean cut and without torn or ragged edges. Burrs resulting from reaming or drilling shall be removed with a tool making 1/16-inch bevel. Holes shall be cylindrical and perpendicular to the member. When necessary to avoid distortion of the hole and when holes are within 4 inches of a point of bending, holes shall be made after bending.

e. PUNCHING: For punching to full size, the punch diameter shall be the nominal diameter of the hole and the die diameter shall be not more than 1/16 inch larger than the punch diameter. For subpunching, the punch diameter shall be 1/4 inch smaller than the nominal hole diameter and the die diameter of the die shall not be more than 3/32-inch larger than the punch diameter. Subpunching for reamed work shall be such that after reaming no punched surface shall appear in the hole periphery.

f. REAMING AND DRILLING: Where holes are reamed or drilled, the diameter of the finished hole shall be as shown on the steel structure drawings.

g. ACCURACY OF PUNCHING, REAMING, AND DRILLING: Holes shall be spaced accurately in accordance with the drawings and shall be located on the gagelines.

h. WELDING: Welding and work related thereto shall be performed in strict accordance with the latest edition of the AWS "Structural Welding Code," D1.1 except Section 9. Welding terms shall be interpreted in accordance with the AWS definitions of welding terms. Welding symbols shown on the drawings shall comply with AWS symbols. A shielded arc-welding process or a submerged arc-welding process shall be used. Welds shall be as shown on the drawings, shall be continuous unless otherwise noted, and shall be made in such a manner that residual shrinkage stresses will be reduced to a minimum. If not previously qualified, the welding process and the welding operators employed in performing the work covered by these specifications shall be qualified, in accordance with the AWS "Standard Qualification Procedure." Welds shall have full penetration through the material, unless otherwise shown on the drawings.

Unless otherwise approved by Western, all complete penetration groove welded joints shall be AWS prequalified welded joints. If the Contractor elects to use other than AWS prequalified joints, the joints must be qualified by the Contractor and the results submitted to Western for review at the same time that shop detail and erection drawings are submitted for approval.

i. MEASUREMENTS: Measurements shall be made with a steel tape or rule. When measurements are made, the members and the steel tape or rule shall be within 10°F of the ambient temperature.

j. EDGE DISTANCES AND BOLT SPACING: Unless otherwise shown on the drawings or noted in these specifications, edge distances and bolt spacing shall conform to the requirements of the latest AISC "Specifications for Design, Fabrication, and Erection of Structural Steel for Buildings."

k. MACHINE FINISH: Where finished surfaces are specified on the drawings and the type of finish is not specified, the type of finish required shall be that most suitable for the part to which it applies and shall be average or rough as defined herein. Where an average finish is required, smooth surfaces shall be produced, but slight toolmarks will be allowed. Where a rough finish is required, rough machining sufficient only to produce a plane surface true to dimensions will be allowed. In general, an average finish will be required for surfaces in permanent contact where a tight joint is required and a rough finish will be required for all other machine surfaces. Where the finish is called for on the drawings, the members shall be finished true to line and free from twists, bends, and open joints, in accordance with the noted degree of finish.

l. COMPRESSION JOINTS: The surfaces of compression joints depending on contact bearings shall be faced so as to have full contact bearing when aligned and welded.

m. COLD FORMING: The Contractor shall have detailed procedures which describe cold forming practices, techniques, and controls. These documents shall be available for review by the Western inspector. Such procedures shall be capable of producing the desired bends without producing any undue amount of cracking. Any cracking or opening of surface laminations shall be investigated and repairs performed, inspected, and recorded. Any plate that displays gross cracking, laminations, or lamellar tears, shall be rejected and withdrawn from production.

3.2.6 MARKING:

Individual pieces shall be marked with the correct designation shown on the Contractor's approved shop drawings. Marking shall be done by stamping numerals or letters of 1/2-inch minimum height into the metal. Marks shall be clearly legible after galvanizing.

Each pole section shall be identified with an identification plate located approximately 6 feet above groundline, base, or splice point, with the following stamped into the plate with letters not less than 1/4-inch high:

a. Manufacturer's name.

b. Month and year of fabrication.

c. Pole designation (e.g., 28S-60).

d. Weight of pole section.

e. Groundline, base, or splice moment.

Plates shall be fabricated from a noncorrosive, nonstaining metal such as bronze, brass, or aluminum. Plates shall be suitably attached.

3.2.7 GALVANIZING:

a. CLEANING: After the shop work has been completed, materials shall be clean of rust, loose scale, dirt, oil, grease, slag, and other foreign substances.

b. GALVANIZING: Materials shall be galvanized after fabrication in accordance with ASTM A 123. Finished compression members shall not have lateral variations greater than 1/1000 of the axial length between the laterally supported points. Holes in material shall be free of excess spelter after galvanizing.

c. GALVANIZING OF HARDWARE: Bolts, nuts, washers, locknuts, and similar hardware shall be galvanized in accordance with ASTM A 153. Excess spelter shall be removed by centrifugal spinning.

d. STRAIGHTENING AFTER GALVANIZING: Materials warped by the galvanizing process shall be straightened by being rerolled or pressed. The material shall not be hammered or otherwise straightened in a manner that will damage the protective coating. If, in the opinion of the COTR, the material has been excessively bent or warped in the process of fabrication or galvanizing, such defects shall be cause for rejection.

e. REPAIR OF GALVANIZING: Material on which galvanizing has been damaged shall be redipped unless, in the opinion of the COTR, the damage is local and can be repaired by applying zinc dust-zinc oxide paint. Where repair is authorized, the damaged area shall be cleaned by wiping with clean rags saturated with mineral spirits or xylene, followed by hand wire brushing. After wire brushing, the area shall be recleaned with solvent to remove residue, and given two coats of zinc dust-zinc oxide paint. Any member on which the galvanized coating becomes damaged after having been dipped twice shall be rejected.

3.2.8 HANDLING AND TRANSPORTING:

Structural steel shall be transported and handled to avoid bending or damage. Pieces or structures bent in handling may be used only if they can be straightened without damage to the pieces or structures.

When temporary storage is necessary, all steel shall be placed on timber blocking, furnished by the contractor, to prevent the material from coming in contact with the ground or surface water.

The repair of materials damaged due to the operations of the Contractor shall be made by and at the expense of the Contractor.

3.2.9 INSTALLATION:

Embed each pole to the depth indicated on the approved erection drawings and as specified in the "Design Requirements" paragraph.

Poles shall be set and aligned to be within 3 inches of their theoretical centerline location. After the poles have been set and aligned properly, they shall be held in a manner to prevent displacement during the placing of backfill concrete and for a minimum of 3 days thereafter. All excavated material shall be removed from the right-of-way and disposed of in accordance with the "Disposal of Waste Materials" paragraph.

Poles shall only be lifted by slings attached to the lifting lugs or other approved devices as shown on the final erection drawings.

Field welds shall be thoroughly cleaned and repaired in accordance with the "Galvanizing" paragraph. At this time, remove any foreign material which adhered and would be detrimental to the appearance of the structure.

Surfaces within 2 inches of any field weld location shall be free from any material that would prevent proper welding or produce objectionable fumes while welding.

SUBDIVISION 3.3--CONCRETE POLE STRUCTURES

3.3.1 DESIGN REQUIREMENTS:

a. DESIGN LOADINGS: Concrete pole structures shall be designed to be reliable, servicable, and resist, without permanent distortion, loading conditions called for on the drawings and loads required for manufacturing, handling, transporting, and installing. They shall be designed to resist the effect of deflection (secondary bending) due to vertical loads including dead load of the pole and guy loads, where applicable, resulting from treating the guys as elastic members.

b. STRUCTURAL ANALYSIS AND DESIGN: Concrete poles shall be prestressed, directly embedded, and designed to withstand loads shown on the drawings, without exceeding the ultimate strength of the poles.

They shall be designed for ultimate strength in accordance with the basic assumptions and requirements of the A.C.I. 318-83, "Building Code Requirements for Reinforced Concrete".

The structures shall be designed based on an analysis of stress and combination of stresses due to moment, shear, torsion, and axial loads. Also, they shall be investigated for stresses pertinent to pre-stressed concrete and for stresses induced by handling, transporting, and installing.

The computed ultimate stresses under full design loads shall not exceed the following:

For concrete: 85 percent of its 28-day compressive strength.

For reinforcement: specified yield strength of steel used.

c. SPECIAL DESIGN REQUREMENTS: The concrete poles may be circular, rectangular, "I" shaped, or octagonal in shape; and solid or hollow in cross section.

Davit arms for Types 28L and 28S poles shall be identical to davit arms for Type 28X poles.

Attachments and similar details shown on Western outline drawings may be modified slightly to conform with the Contractor's standard practice. Attachment and similar details not shown on the Western outline drawings shall be determined by the Contractor based on the intended use or manufacturer's recommendations.

Holes and inserts shall be positioned within the tolerances specified in the "Quality Control" paragraph. Davit arms, braces, bolts, and inserts or attachment plates shall be designed for the loads shown on the Western design load or Contractor-furnished design drawings without exceeding the yield or buckling strength of the material.

Hollow poles shall have a concrete cap to seal the top. Guyed hollow poles shall be plugged at the bottom. The plug at the bottom of the pole shall be 12 to 18 inches thick. A bearing plate of adequate thickness may be substituted for the plug.

The pole sections shall have lifting lugs or other approved devices to prevent slippage of slings and insure safe lifting and handling.

Steel davit arms, braces, attachments, bolts, inserts, or similar hardware shall be galvanized.

d. ALTERNATE GROUND WIRE ATTACHMENT: A galvanized steel extension may be used to attach the overhead ground wire above the top of the concrete pole. Any alternate ground wire attachment shall be designed for the loads shown on the drawings without exceeding the yield or buckling strength of the material and shall be subject to approval by Western.

e. EMBEDMENT DESIGN: Auger diameter and structure embedment shall be as follows:

(1) Auger Diameter:

(a) Standard Backfill: When Standard Penetration Test results of the soil are greater than 8 blows per foot for the entire excavation below 5 feet as determined by actual tests from the geologic logs or by observation of the excavated material by the COTR, the auger diameter shall provide sufficient clear distance to allow the use of tamping bars all arount the pole to the full hole depth.

(b) Rock Backfill: When Standard Penetration Test results of the soil are 8 blows per foot or less for any portion of the excavation below 5 feet as determined by actual tests from the geologic logs or by observation of the excavated material by the COTR, the auger diameter shall provide a minimum clear distance of 1 foot +3 inches on all sides of the concrete pole. The excavation shall then be backfilled with rock which shall be compacted.

(2) Embedment Length: The pole embedment length "E" (in feet) shall be:

$E = L/10.0 + 6.0$
where L = Total Pole Height above Groundline (in feet).

3.3.2 MATERIALS:

a. PRESTRESSING TENDONS:

(1) Strand: ASTM A 416.

(2) Wire: ASTM A 421.

b. REINFORCING STEEL:

(1) Bars: ASTM A 615.

(2) Spiral Wire: ASTM A 82.

c. CONCRETE:

(1) Portland Cement: ASTM C 150, Type II, L.A. low alkali, sulfate resistant, unless the Contractor submits documentation that aggregates and water are not alkali reactive and that sulfates are not present in injurious quantities. If the Contractor provides satisfactory documentation, then TYPE I cement will be permitted.

(2) Aggregate: ASTM C 33.

(3) Admixtures: ASTM C 494.

(4) Water: Shall be clean, free from injurious amounts of oils, acids, alkalis, salts, organic materials, and deleterious substances.

d. INSERTS: Shall be a noncorrosive material according to manufacturer's specifications and loading criteria.

e. PRESTRESSING STRAND OR WIRE SEALANT:

(1) Colma-Dur manufactured by Sika Chemical Corporation,

(2) MR-37 Polyester Resin manufactured by Celanese Chemical Corporation, or

(3) Approved equal.

f. BOLTS AND NUTS: Bolts, nuts, and washers shall comply with the requirements of an accepted authority such as ASTM. Bolts shall be supplied with locknuts and hardware shall be galvanized in accordance with ASTM A 153.

g. ROCK BACKFILL: Rock backfill shall be reasonably well-graded to 1 1/2-inch maximum diameter.

3.3.3 QUALITY CONTROL:

a. GENERAL: Work shall be in accordance with the latest editions of the ACI Practices and Division I, Division II, Division III, Section I of Division IV, and Division V of P.C.I. MNL-116; in the manufacture and fabrication of materials of the types covered by these specifications, notwithstanding any omissions from these specifications or drawings. The Contractor shall be responsible for the correct fitting of all parts and shall replace, free of cost to Western, any defective materials discovered and shall pay all costs of the correction of any errors not previously discovered.

b. INSPECTION AND TESTS:

(1) Steel Materials: Inspection of steel materials will be made in accordance with the "Materials to be Furnished by the Contractor" paragraph of the "General Requirements" Division. Inspection and tests of steel by Western at the mill will be waived. As soon as practicable after receipt by the contractor of notice of award of contract, the Contractor shall submit to Western, as addressed below, one certified copy of each report of the chemical analysis and physical tests of prestressing tendons, structural steel, and bolts.

Mailing Address: Western Area Power Administration,
ATTN: A2600
P.O. Box 3402
Golden, CO 80401.

No material shall be shipped until certified report copies of tests and analyses have been received.

The cost of making all chemical analyses and physical tests and of furnishing the certified copies of reports of tests and analyses shall be borne by the Contractor. Acceptance of materials or the waiving of inspection shall in no way relieve the Contractor of the responsibility for furnishing materials meetings the requirements of these specifications.

(2) Concrete: Concrete shall develop the minimum compressive breaking strength specified on the approved shop detail and erection drawings. Representative cylinders of each replacement shall be taken at least once from each 8-hour shift work and tested as follows:

(a) One at detensioning.

(b) One at 7 days.

Two copies of the test results shall be submitted to Western, address as in subparagraph b.(1) above.

c. DIMENSIONAL TOLERANCES: Dimensional tolerance from that shown on the drawings shall be as follows:

(1) Length plus embedment (L+E) of the complete structure, + 24 inches, - 6 inches.

(2) Width and depth or diameter -1/16 inch.

(3) Bolt hole or insert spacing $\pm$1/8 inch (vertically).

(4) Bolt hole diameter $\pm$1/16 inch.

(5) Bolt hole location from top of structure $\pm$3 inches.

3.3.4 FABRICATION:

a. GENERAL: Concrete poles and steel components shall be fabricated in accordance with this paragraph and the applicable provisions of the latest editions of:

(1) ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures".

(2) ACI 347 "Recommended Practice for Concrete Formwork".

(3) Prestressed Concrete Institute MNL 116 "Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products".

(4) Industrial Fasteners Institute "Fastener Standards".

(5) AWS D12.1 "Recommended Procedures for Welding, Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction".

(6) AWS D1.1 "Structural Welding Code".

(7) AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings".

b. HOLES: Holes shall be provided through each pole as specified on the drawings. Holes shall be drilled or preformed using steel rods. The rods shall be held rigidly in place during pouring and curing and shall be perpendicular to the face of the pole and its centerline unless otherwise noted on the drawings.

c. INSERTS: Inserts shall be provided as specified on the drawings.

d. FINISHES: Finishes to concrete surfaces shall be as follows:

(1) Static Castings: Finish of static castings shall be smooth with no cracks. Immediately after the screening has been completed, the excess mortar and water shall be removed. The pole top surface shall be troweled until all projections, depressions, and irregularities have been removed and the entire surface has a smooth texture with neat lines. Square corners and sharp edges shall be tooled to form smooth, chamfered corners. The identification plate shall be attached to the pole after the above finishing and prior to the concrete curing.

After the pole is removed from the form, small cavities caused by air bubbles, honeycomb spots, or other small voids shall be cleaned, saturated with water, and pointed with mortar. A small cavity is defined as larger than 1/4-inch width and depth, and not exceeding 2 inches long. Small cavities shall be repaired by opening the cavity sides on a 1 to 1 slope with a mechanical grinder, cleaning thoroughly, and patching with an epoxy-aggregate mixture that will blend with concrete. Apply mixture in accordance with manufacturer's specifications.

Poles with larger cavities shall be rejected.

(2) Centrifugal Castings: Finish of centrifugal castings shall be smooth with no cracks. Square corners and sharp edges shall be tooled to form smooth, chamfered corners. The identification plate shall be attached to the pole in such a manner as to fit the contour of the pole.

After the pole is removed from the form, all small cavities caused by air bubbles, honeycomb spots, or other voids shall be cleaned, saturated with water and pointed with mortar. A small cavity is defined as larger than 1/4-inch and smaller than 1/2 inch in diameter or deeper than 1/4 inch. Larger cavities not exceeding 2 inches long shall be

repaired by opening the cavity sides on a 1 to 1 slope with a mechanical grinder, cleaning thoroughly, and patching with an epoxy-aggregate mixture that will blend with the concrete. Apply mixture in accordance with the manfuacturer's specifications.

Poles with larger cavities shall be rejected.

e. TENSIONING: The prestressing tendons shall be tensioned to the initial force shown on the approved shop detail drawings.

f. DETENSIONING: Detensioning shall be performed when the test cylinders indicate the concrete has developed the compressive strength shown on the drawings. In no case shall detensioning take place before the concrete has developed a compressive strength of 125 percent of compression induced by initial prestress.

The detensioning operation shall be performed in a manner to keep the prestressing forces symmetrical about the longitudinal axis. Prestress tendons shall be burned off below the surface of the pole and then sealed with an epoxy protective coating in accordance with the manufacturer's specifications.

3.3.5 MARKING:

Each pole section shall be identified with an identification plate located approximately 6 feet above ground line, base, or splice point with the following stamped into the plate with letters not less than 1/4 inch high:

a. Manufacturer's name.

b. Month and year of manufacture.

c. Pole designation (e.g., 28S-60).

d. Weight of pole section.

e. Ground line, base, or splice moment.

Plates shall be fabricated from a noncorrosive, nonstaining metal such as bronze, brass, or aluminum. The plate shall have suitable anchors to permit attachment.

3.3.6 HANDLING AND TRANSPORTING:

Prestressed concrete poles shall be lifted and supported during manufacturing, stock piling, and transporting only at the lifting or support points, or both, as shown on the approved erection drawings.

Transportation and site handling shall be performed with acceptable equipment and methods by qualified personnel. Poles shall not be dragged along the ground.

Any pole that develops visible cracks or is damaged beyond the repair limits specified in the "Fabrication" paragraph shall be rejected.

Galvanized steel components shall be transported and handled to avoid bending or damage to the galvanizing. Pieces bent in handling may be used only if they can be straightened without injury to the galvanizing. Material on which galvanizing has been damaged shall be redipped unless, in the opinion of the COTR, the damage is local and can be repaired by applying zinc dust-zinc oxide paint. Where repair is authorized, the damaged area shall be cleaned by wiping with clean rags saturated with mineral spirits or xylene, followed by hand wire brushing. After wire brushing, the area shall be recleaned with solvent to remove residue, and given two coats of zind dust-zinc oxide paint. Any member on which the galvanized coating becomes damaged after having been dipped twice shall be rejected.

The repair of material damaged due to the operations of the Contractor shall be made by and at the expense of the Contractor.

Concrete poles and steel components shall be supported by Contractor-supplied timber blocking to prevent contact with the ground.

3.3.7 INSTALLATION:

Embed each pole to the depth indicated on the approved erection drawings and as specified in the "Design Requirements" paragraph.

Holes shall be dug in the correct locations and the diameter shall be indicated on the approved erection drawings and as specified in the "Design Requirements" paragraph. The poles shall be carefully placed in the holes so that the structure grounding materials will not be damaged or displaced. Poles shall be set plumb and aligned to be within 3 inches of their theoretical centerline location. After the poles have been set and aligned properly, the holes shall be backfilled.

Unless otherwise specified, holes dug for poles shall be backfilled with earth. The backfill in each hole shall be compacted to a dry density not less than the natural in-place dry density of the surrounding earth. The backfill shall be banked and tamped around the poles to a height of 12 inches above the natural ground surface. Any surplus excavated material shall be leveled neatly. If satisfactory backfill material is not available from excavation or within the immediate vicinity of the structure, the Contractor shall import any additional backfill material required.

Poles shall only be lifted by slings attached to the lifting lugs or other approved devices as shown on the final erection drawings.

Where holes are to be rock backfilled, all excavated material shall be removed from the right-of-way and disposed of in accordance with the "Disposal of Waste Materials" paragraph of the "General Requirements" Division. After the poles have been set in the holes and aligned properly, the holes shall be backfilled with the rock backffill. The rock backfill shall be vibrated in place in the hole. The vibrator shall be slowly withdrawn as the hole becomes filled so

that the vibrating tip is about 1 foot below the surface of the rock backfill in place. Sufficient water shall be poured in the hole as rock backfill is added to maintain a water level above the rock backfill as it is vibrated. A maximum uniform density condition from the bottom of the hole to the original ground surface shall be obtained. The vibrators shall be of the immersion type with sufficient length to permit vibration at the bottom of the hole. To insure adequate vibration for the backfill, the diameter of the vibrator head should not exceed 2 inches, shall be capable of producing 7,000 rpm when immersed, and have sufficient power to compact the backfill material adequately.

Errors and omissions in installation of concrete pole structures shall be corrected by the Contractor, including the tightening of all loose bolts and locknuts, at no additional cost to Western.

SUBDIVISION 3.4--GUYS AND ANCHORS

3.4.1 GENERAL:

Determine the number, size, and location of guys and anchors required for the Types 28A, 28B, 28C, 28D, and 28N pole structures. The determination shall be based on the criteria outlined in this Subdivision and on drawing 2a (43-28A 2050).

Guys and anchors shall be considered as part of the respective pole structure for which they are required and shall be included in the appropriate unit price per structure bid in Section B.

3.4.2 DESIGN REQUIREMENTS:

a. GUYS:

(1) General: Determine the optimum guy size and arrangement best suited for the pole structure required. Guys shall be located to provide a minimum 78-inch clearance from the conductor attachment at the end of the insulator.

(2) Structural Analysis and Design: Guys shall be treated as elastic members in the structural analysis of the pole structure. The modulus of elasticity for guy material shall be taken as 23,000 ksi. Loads in the guys shall not exceed 65 percent of the minimum rated breaking strength of the guys.

(3) Hardware and Attachments: Guy hardware and attachments shall be capable of supporting the minimum rated breaking strength of the guys. Steel attachments shall be galvanized.

b. GUY ANCHORS: The Contractor shall determine the type and number of anchors required for the guys. The guy anchors shall develop the minimum rated breaking strength of the attached guys. No more than two guys shall be attached to any anchor. The Contractor may furnish screw type, embedded concrete type, or other types of anchors; subject to approval by Western. Anchor drawings and data shall be submitted for approval in accordance with the provisions of the "Contractor-Furnished Drawings and Data" paragraph. The data shall include test results and certification from the supplier of the anchors that the anchors will develop the required holding capacity.

3.4.3 MATERIALS:

a. GUYS: ASTM A 475 Class A, or A 586 Class A, galvanized.

b. GUY HARDWARE: Guy hardware shall be of the type and manufacturer's rated strength as called for on the approved shop detail and erection drawings and shall be galvanized.

c. SCREW ANCHORS: Screw anchors shall be of the type and manufacturer's rated strength as called for on the approved shop detail and erection drawings, be of a noncorrosive material, galvanized, or coated with an approved noncorrosive material.

d. CONCRETE ANCHORS: Concrete materials shall conform to the requirements of the "Materials" paragraph of the "Concrete Pole Structures" Subdivision.

3.4.4 INSTALLATION:

Guys and anchors shall be installed in accordance with the manufacturer's recommendations. Guys shall be pretensioned as shown on the approved erection drawings or tightened to take out the slack if pretensioning is not required.

Errors and omissions in the installation of the guys and anchors shall be corrected by the Contractor, including the retightening or retensioning of the guys, at no additional cost to Western.

SUBDIVISION 3.5--CLIMBING PROVISIONS

3.5.1 GENERAL:

The Section B item "Removable climbing provisions" includes furnishing materials and performing work required to provide and deliver 65 removable climbing rung sections for the pole structures.

Furnishing and installing fixed climbing provisions and climbing and ground wire clips shall be included in the appropriate unit price per pole bid in Section B.

3.5.2 DESIGN REQUIREMENTS:

a. RUNG SECTIONS: Rung sections shall be of the center support type. The dimensions shown on drawing 3 (43-28 2200) may be varied slightly to conform to the manufacturer's standard practice. Rung sections shall be able to withstand a pulling force of 2000 pounds on the assemblies without exceeding the yield point of the material.

b. RUNGS: Rungs shall be 3/4-inch diameter steel step bolts. Bolts shall have a minimum 2-inch diameter head and provide a minimum 6-inch clear foot room after installation. Vertical distance between rungs shall be approximately 15 inches.

c. CLIMBING AND GROUND WIRE CLIPS: Climbing and ground wire clips shall be provided for on concrete pole structures as shown on drawing 3 (43-28 2200). Inserts and bolts to attach the clips to the poles shall develop a minimum tensile strength of 2000 pounds. Climbing clips shall be provided for on steel pole structures as shown on drawing 3 (43-28 2200). Welds to attach the clips to the poles shall develop a minimum tensile strength of 2000 pounds.

d. DRAWINGS AND DATA: Drawings and data for the climbing provisions shall be submitted for approval in accordance with the provisions of the "Contractor-Furnished Drawings and Data" paragraph. Drawings shall show all pertinent details of the rung sections, rungs, and clips. Data shall contain manufacturer's certification that the climbing system meets or exceeds the load requirements outlined above.

e. MATERIALS: Materials shall conform to an applicable ASTM Standard suitable for the intended use.

f. PROTECTIVE COATINGS: Materials shall be galvanized after fabrication.

3.5.3 INSTALLATION:

Climbing clips shall be welded to the steel poles in the shop.

The Contractor may use the rung sections to accomplish other work required under these specifications; provided sections shall not be left on the poles within 20 feet of the ground without a Contractor representative at the site.

The Contractor shall, before completion of this contract, install fixed working rung sections on each pole structure.

Removable climbing rung sections shall be delivered as follows:

(1) 20 sections to Western's Conrad Substation located near Conrad, Montana,

(2) 20 sections to Western's Bole Substation located near Fairfield, Montana, and

(3) 25 sections to Western's Havre Substation located near Havre, Montana.

The sections shall be stored as directed by the COTR.

Material damaged by the Contractor due to his method of operation shall be replaced.

Errors and omissions in the installation of the rung sections and clips shall be corrected by the Contractor, including the retightening of all bolts, at no additional cost to Western.

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DIVISION 4 - ELECTRICAL

SUBDIVISION 4.1--ELECTRICAL, GENERAL

4.1.1 GENERAL:

Comply with all requirements specified under the "Safety and Health Requirements" Subdivision of the "General Requirements" Division.

The work under these specifications shall be performed in a first-class workmanlike manner and in accordance with the requirements of these specifications and the details shown on the drawings. Steps shall be taken to ensure uniformity of assembly and construction. The Contractor's equipment and materials used to complete the installation shall be subject to the COTR's approval.

Some of the drawings included in these specifications are typical only and the Contractor shall not be entitled to any allowance above the price bid in Section B by reason of any modification of a minor nature which may be required.

4.1.2 ITEMS REQUIRING SPECIAL ATTENTION:

Items requiring special attention include the bolts in line hardware and accessories and the sleeves in compression fittings. Obtain installation instructions from the manufacturers of such items and furnish at least two copies of such instructions to the COTR. Adhere to the following installation procedures:

a. BOLT TIGHTENING: Use torque wrenches, or other manufacturer-recommended methods, to tighten bolts used with suspension clamps, vibration dampers and jumper conductor connectors. Bolts shall be torqued to the manufacturer's recommended values. Western will make spot checks of bolt torques and, if deficiencies are found, the Contractor shall retorque bolts to the extent deemed necessary by the COTR.

b. COMPRESSION FITTINGS: Arrange for the proper supervision of the installation of all compression fittings to ensure that compression splices are centered, that the correct length of steel strand is inserted into the fittings and that the steel sleeves of splices and dead ends are properly compressed onto the steel strands. Where aluminum sleeves are used for conductor compression fittings, care must be exercised to ensure that compression deformations do not become sources of corona discharge. The COTR reserves the right to witness and approve the installation of all compression fittings and to reject any compression fitting which is installed without the COTR being present to witness the installing operation.

SUBDIVISION 4.2--CONDUCTOR INSULATOR ASSEMBLIES

4.2.1 GENERAL:

Furnish all materials, assemble, and install conductor-insulator assemblies in accordance with the drawings and these specifications. Furnish the proper hardware for attaching the conductor-insulator assemblies to the structures and to the conductor.

The Section B items for furnishing, assembling, and installing insulator assemblies of various types shall include the cost of furnishing all materials and performing all work and tests as described in this paragraph.

Typical conductor insulator assembly attachments for the various types of structures and material quantities for each type of structure are shown on 14 (GTF-CON T100) and in Table 1. Conductor insulator assembly details are shown on drawings 16 (41 1001) and 15 (GTF-CON 1000).

4.2.2 MATERIALS:

All materials to be used on the line end of insulator assemblies shall be protected during shipment and handling to prevent any damage that would become a source of corona discharge. Turnbuckles may be used, at the Contractor's option and at no additional cost to Western, as a part of tension insulator assemblies.

a. PORCELAIN-TYPE INSULATORS: The insulators for conductor-insulator assemblies shall be of the cap-and-pin, ball-and-socket, radio-free type. The insulator shells shall be made of wet-process porcelain. The insulator units shall meet the requirements of the latest ANSI C 29.2, except as otherwise specified in these paragraphs. The color of the glaze on all porcelain insulators shall be brown and all materials lists or purchase orders should clearly indicate this requirement.

The 20,000-pound strength insulators shall be the same as Class 52-3, except that the combined mechanical and electrical strength rating shall be 20,000 pounds.

The 40,000-pound strength insulators shall be the same as Class 52-8 except that the combined mechanical and electrical strength rating shall be 40,000 pounds.

Cotter pins shall be made of stainless steel, shall be of the self-locking type, and shall have a spread of approximately 1 inch at the end of the legs.

b. LINE-POST INSULATORS: The horizontal line-post insulators shall have a minimum cantilever strength of 650 pounds. The insulators shall be complete with mounting bases and aluminum conductor clamp suitable for use directly on 954,000-circular mil, 45/7 ACSR conductor.

The horizontal line-post insulators shall have a minimum positive impulse flashover value of 1265 kilovolts.

c. POLYMER-FIBERGLASS INSULATORS: The Contractor may furnish polymer fiberglass suspension-type and post-type insulators in lieu of porcelain-type insulators, provided that the polymer-fiberglass insulators are equal to the porcelain insulators, herein specified, in mechanical strength and electrical characteristics.

d. SUSPENSION CLAMPS: The suspension clamps for use with ACSR conductors shall be the sized type and shall be suitable for use directly on the conductors without armor rods. Clamp-top-type suspension clamps for use on line-post insulator are not acceptable except as part of a line-post jumper assembly.

The design of the clamps shall be such that unit pressures on the conductor are maintained at levels which prevent damage to conductor strands under maximum loading conditions encountered on the line. The conductor supporting seat shall have sufficiently large longitudinal radii to prevent concentration of vibration bending and tension stresses at the conductor takeoff points. The centers of radii of the conductor seat shall be located on vertical lines extended below the clamp and no closer to the center of the clamp than the outside edges of the U-bolts. The clamp bore shall have a diameter equal to the nominal diameter of the conductor with which it is to be used with a tolerance of plus 0.1 inch. The radius of curvature of the clamp bore shall be maintained through an angle of 160° for the clamp body and of at least 140° for the clamp-keeper piece. The clamp shall be designed for a maximum-total vertical-conductor angle of 30° (15° on each side).

The suspension clamps shall have aluminum alloy bodies, shall have no bolt ends projecting below the bottom of the clamp, shall have all surfaces smooth and free from burrs, and shall have all edges and fillets rounded to minimize field concentration and radio interference. Each clamp shall be complete with a keeper piece, at least two U-bolts, and a 5/8-inch diameter bolt having a hexagonal head and provided with hexagonal nut and with stainless-steel self-locking-type cotter key. The unthreaded length of the bolt shall be adequate to ensure free rotation of the bolt with the nut run onto the bolt to the limit permitted by the threaded portion of the bolt. Each suspension clamp shall be capable of holding the conductor without slipping under an unbalanced tension of 5000 pounds. The clamps shall be the nonmagnetic type. Each suspension clamp shall be designed to limit losses to a maximum of 10 watts, with a 600-ampere, root mean square, 60-hertz current flowing through the conductor.

Magnetic losses shall be determined by averaging the losses as determined from a simultaneous measurement on at least four clamps. If dissimilar metals are used in making up the clamp, suitable precautions shall be taken to minimize corrosion due to electrolytic action.

The minimum allowable ultimate strength for suspension clamps for use with the conductor shall be 25,000 pounds.

e. COMPRESSION DEAD ENDS: Compression dead ends shall be used. Each dead end assembly shall include a hot-dipped galvanized-steel eye end, aluminum sleeve, jumper pad, and jumper connector of the compression type with bolted connection between the jumper connector and the jumper pad. Each dead end, when attached to the conductor, shall develop not less than 95 percent of the ultimate strength of the conductor and shall have a conductivity of not less than that of the conductor.

The angle between the dead end bodies and the jumper connectors shall be approximately 60°. The dead ends and jumper connectors shall be protected during shipment to minimize damage that might serve as a point source for corona discharge. If such damage does occur, it shall be corrected by the contractor before installation.

f. ASSEMBLY COUPLING HARDWARE: Assembly coupling hardware for 20,000 pound strength insulator assemblies shall have a rated ultimate strength of not less than 30,000 pounds. Assembly coupling hardware for 40,000 pound strength insulator assemblies shall have a rated ultimate strength of not less than 40,000 pounds. Each component part of coupling hardware used in the assemblies shall also be designed such that permanent deformation or yield does not occur at less than two-thirds of its rated ultimate strength.

Hardware shall have no sharp edges or projections and shall be of corona-free quality where necessary, shall be galvanized, and shall be complete with nuts, bolts, and self-locking stainless steel cotter keys.

All bolts, nuts, and locknuts shall be made of galvanized steel. The bolts shall meet or exceed the requirements of FF-B-575, Type II, Grade 5, and shall be made of a grade of steel commensurate with the ultimate strength specified for the hardware.

Unless otherwise specified, all ferrous metal shall be galvanized in accordance with ASTM A 153. All metal shall be free from burrs, sharp edges, lumps, and dross, and shall be smooth so that interconnecting parts will fit properly and so that the parts may be assembled and disassembled readily. All threaded parts shall be galvanized after being threaded and excessive zinc removed from the threads. All nuts and locknuts shall be retapped after being galvanized and shall be capable of being threaded the entire length of the threads without the use of a wrench.

Hardware used on tension and suspension insulator assemblies shall be such that free conductor movement shall not be restricted in any direction.

4.2.3 TESTS:

All insulators, materials, and assemblies shall be subjected to the applicable tests required by this paragraph. Tests shall be conducted at the expense of

the Contractor. The Contractor shall furnish all insulators, hardware, fittings, test apparatus, and instruments required; and shall complete the tests. The COTR reserves the right to witness all tests and to approve the manner in which the tests are conducted.

a. PORCELAIN-TYPE INSULATORS: Each class of suspension-type insulator units shall be tested in accordance with all the requirements of the latest edition of ANSI C 29.2 for the mechanical and electrical strength ratings required under these specifications.

b. LINE POST INSULATORS: Post-type insulators shall be tested in accordance with ANSI C 29.7.

c. POLYMER FIBERGLASS INSULATORS: Perform tests to verify that the polymer fiberglass insulators meet the minimum requirements of the "Materials" paragraph.

d. COMPRESSION DEAD ENDS: Design tests shall be performed which show that compression dead ends develop not less than 95 percent of the ultimate strength of the conductor with which they are to be used.

4.2.4 SUBMITTALS:

a. GENERAL: The Contractor shall furnish drawings, data, and test reports in accordance with the "Drawings and Data" paragraph.

b. REPORTS OF TESTS: Furnish certified reports of results of tests performed as follows:

(1) Porcelain-Type Suspension Insulator Units:

(a) Design Tests:

(aa) Critical Impulse Flashover Tests: ANSI C 29.2, paragraph 8.2.3.

(bb) Time-Loading Test: ANSI C 29.2, paragraph 8.2.5.

(cc) Residual-Strength Test: ANSI C 29.2, paragraph 8.2.7.

(b) Quality Conformance Tests:

(aa) Combined Mechanical and Electrical Strength Tests: ANSI C 29.2, paragraph 8.3.4.

(c) Routine Tests:

(aa) Tension-Proof Tests: ANSI C 29.2, paragraph 8.4.3.

(2) Line Post Insulators:

(a) Design Tests:

(aa) Critical Impulse Flashover Tests: ANSI C 29.7, paragraph 8.2.3.

(b) Quality Conformance Tests:

(aa) Cantilever-Strength Tests: ANSI C 29.7, paragraph 8.3.4.

(c) Routine Tests:

(aa) Routine Cantilever Tests: ANSI C 29.7, paragraph 8.4.2.

(3) Polymer-Fiberglass Insulators: The polymer-fiberglass insulators shall be tested, and certification submitted to Western, demonstrating that the insulators meet or exceed the mechanical and electrical strengths required for porcelain-type units required in this specification.

(4) Compression Dead Ends: Subparagraph d. of the "TESTS" paragraph above.

c. Certified reports of results of previous design tests made on insulators and compression dead ends identical to those required under these specifications will be accepted as meeting the test requirements of these specifications.

4.2.5 INSTALLATION:

The Contractor shall furnish all materials, assemble, and install conductor insulator assemblies as shown on drawings 16 (41 1001), 17 (41 1003), 15 (GTF-CON 1001), 14 (GTF-CON T100) and as shown in Table 1.

Where practical, the nuts and cotter keys used in assemblies shall be faced in toward the structure to facilitate removal during hot line maintenance. This does not apply to the cotter keys in the individual insulator units.

Each completed suspension insulator string shall be installed on the conductor and adjusted so as to hang in a vertical plane through the axis of the structures after the conductors are clipped in. The clipping in of conductors shall then be completed and all nuts adequately tightened.

The compression dead ends and jumper connectors in tension assemblies shall be applied to the conductor in accordance with the manufacturer's recommendation. The Contractor shall furnish all necessary tools and joint-inhibitor compound.

Jumper terminal connectors shall be attached to the line side of dead end terminal pads and the jumper terminal bolt shall be inserted from the line end toward the tower end of the assembly where such installation will minimize corona onset and radio-influence voltages.

Turnbuckles shall be initially installed such that not more than one-half of the allowable adjustment in either direction is used.

The Contractor shall obtain from manufacturers the installation instructions required for proper assembly and installation of insulator assemblies, and shall furnish two copies of such instructions to the COTR. The Contractor shall also coordinate between the manufacturers of insulator assemblies and structure fabricators for proper installation of assemblies.

TABLE 1

STRUCTURE DESIGNATION	USE	CONDUCTOR INSULATOR ASSEMBLY				OVERHEAD GROUND WIRE ASSEMBLY	
		SUSPENSION					
		I-String (Note 1)	V-String (Note 4)	Line Post	Tension (Note 3)	Suspension (Note 2)	Tension
28 L	Tangent Suspension	2	1	-	-	1	-
28 S	Tangent (0°-1°)	2	1	-	-	1	-
28 X	Tangent (0°-4°)	2	1	-	-	1	-
28 A	Suspension (4°-20°)	3	-	-	-	1	-
28 B	Suspension (20°-40°)	3	-	-	-	1	-
28 C	Suspension (40°-60°)	3	-	-	-	1	-
28 D	Tension (0°-30°)	2 Jumper	-	1 Jumper	6	-	2
28 N	Tension (60°-90°)	-	-	-	6	-	2

Notes:

1. For suspension structures having line angles up to 26°, each I-string insulator assembly shall have one suspension clamp and 14 ANSI class 52-3 insulator units with minimum M&E strength 20,000 pounds, with hardware having minimum ultimate strength of 30,000 pounds. For suspension structures having line angles greater than 26°, each I-string insulator assembly shall have two suspension clamps, a yoke plate, and 14 ANSI class 52-8 insulator units with minimum M&E strength of 40,000 pounds, with hardware having minimum ultimate strength of 40,000 pounds.

2. The overhead ground wire assembly, when used on suspension structures having line angles up to 26°, shall have one suspension clamp. The overhead ground wire assembly, when used on suspension structures having line angles greater than 26°, shall have two suspension clamps and a yoke plate.

3. Tension insulator assemblies shall have hardware with minimum ultimate strength of 40,000 pounds, 15 ANSI class 52-8 insulator units with minimum M&E strength of 40,000 pounds, and hot-line fittings as shown on drawing 16 (41 1001).

4. Each V-string insulator assembly shall have 14 ANSI class 52-3 insulator units per leg with minimum M&E strength of 20,000 pounds, with the minimum ultimate strength of hardware as shown on drawing 15 (GTF-CON 1001).

SUBDIVISION 4.3--ACCESSORIES FOR STEEL OR CONCRETE STRUCTURES

4.3.1 GENERAL:

Furnish, assemble, and install all accessories for steel or concrete structures in accordance with the drawings and these specifications. All assemblies (excluding conductor insulator assemblies), hardware, and accessories described in this paragraph, shall be included as part of the respective structures.

The Section B items "Steel or concrete pole structures" shall include the following:

a. Furnishing, assembling, and installing overhead ground wire assemblies, structure grounds and ground rods, and performing all work to complete the structure installations as described in these specifications.

b. All tests required by this paragraph, excluding tests for conductor insulator assemblies.

c. Furnishing and installing structure number and aerial patrol number signs.

4.3.2 MATERIALS AND INSTALLATION:

a. OVERHEAD GROUND WIRE ASSEMBLIES: The overhead ground wire assemblies shall be furnished in accordance with drawings 20 (41 1006) and 14 (GTF-CON T100), and in accordance with Table 1 of the "Installation" paragraph of the "Conductor Insulator Assemblies" Subdivision.

Turnbuckles may be used, at the Contractor's option and at no additional cost to Western, as part of tension assemblies.

(1) Suspension Clamps: Suspension clamps shall be made of malleable iron or high-strength, drop-forged steel, shall be galvanized, and shall be Ohio Brass Catalog No. 83064 or equal. The clamps shall be sized for use with 1/2-inch, 7-wire, steel-strand overhead ground wires without armor rods installed and shall be suitable for use on vertical line angles from 3° to a maximum of 35°. The suspension clamps shall have an ultimate strength of 15,000 pounds. The overhead ground wire supporting seat shall have sufficiently large longitudinal radii to prevent concentration of vibration bending and tension stresses at the overhead ground wire takeoff points. The centers of radii of the overhead ground wire seat shall be located on vertical lines extended

below the clamp and no closer to the center of clamp the outside edges of the U-bolts. Each clamp shall be complete with at least two U-bolts, keeper piece, a 5/8-inch diameter bolt having a hexagonal head and provided with a hexagonal nut and with stainless steel self-locking-type cotter key. The unthreaded length of the bolt shall be adequate to insure free rotation of the bolt with the nut run onto the bolt to the limit permitted by the threaded portion of the bolt. The cable seat and keeper piece shall be smooth and free from burrs. Each suspension clamp assembly shall be capable of holding the overhead ground wire without slipping under an unbalanced tension of 4000 pounds.

(2) Compression Dead Ends: Compression dead end assemblies for the overhead ground wires shall consist of a galvanized-steel eye and an aluminum sleeve or consist of a stainless steel sleeve connected to a galvanized-steel clevis with the clevis connected to a galvanized-steel eye. Each dead end assembly shall develop no less than 95 percent of the ultimate strength of the steel-strand overhead ground wire with which it is used.

(3) Assembly Coupling Hardware: Assembly coupling hardware shall be in accordance with subparagraph f. of the "Materials" paragraph in the "Conductor Insulator Assemblies" Subdivision and shall have a rated ultimate strength of not less than 30,000 pounds.

(4) Tests and Inspection: Materials and assemblies shall be subjected to the tests listed below, at the expense of the Contractor. The Contractor shall furnish all hardware, fittings, test apparatus, and instruments required, and shall complete the tests. The COTR reserves the right to witness all tests and to approve the manner in which the tests are conducted.

(a) Compression Dead End Design Tests: Design tests shall be performed which show that the compression dead ends develop not less than 95 percent of the ultimate strength of the overhead ground wire with which they are to be used.

(5) Construction, Assembly, and Installation: Overhead ground wire assemblies shall be assembled and installed in accordance with the following details: and as shown in Table 1 of the "Installation" paragraph of the "Conductor Insulator Assemblies" Subdivision and on drawing 14 (GFT-CON T100).

Each completed suspension assembly shall be installed on the overhead ground wire and adjusted so as to hang in a vertical plane through the axis of the structures after the overhead ground wires are clipped in. The clipping in of overhead ground wires shall then be completed and all nuts tightened adequately.

Compression dead ends in tension assemblies shall be applied to the overhead ground wires in accordance with manufacturer's recommendations. The Contractor shall furnish all necessary tools and joint-inhibitor compound.

Turnbuckles shall be initially installed such that not more than one-half of the allowable adjustment in either direction is used.

Obtain the manufacturers installation instructions required for proper assembly and installation of assemblies, and furnish two copies of instructions to the COTR.

b. ACCESSORIES:

(1) Grounding for Steel/Concrete Structures: Materials for, and installation of, grounding for steel/concrete structures shall be in accordance with drawing 22 (41 1015).

(2) Structure Signs: Structure number signs shall be in accordance with drawing 26 (41 9007) and aerial patrol signs shall be in accordance with drawing 25 (41 9005) except that mounting holes shall be drilled in accordance with drawing 14 (GTF-CON T100).

The signs shall be secured on a steel pole structure with fasteners driven by a power actuated tool as manufactured by Ramset Fastening System, 12100 Berea Road, Cleveland, OH 44111; by Remington Arams Company, Inc., 939 Barnum Avenue, Standford, CT 06902. The body of the fasteners shall be limited to a length which will not penetrate the wall of the flat steel surface on which the sign is to be mounted. Holes will not be drilled in tubular steel members.

(a) Structure Number Signs: The Contractor shall install one structure number sign, with the number designated on the plan and profile drawings, on each structure in accordance with drawing 14 (GTF-CON T100).

(b) Aerial Patrol Signs: The Contractor shall install two aerial patrol signs on the first structure of each mile section of line in accordance with drawing 14 (GTF-CON T100).

SUBDIVISION 4.4--CONDUCTOR, OVERHEAD GROUND WIRE, AND ACCESSORIES

4.4.1 CONDUCTORS:

a. GENERAL: Provide all materials including conductor, conductor joints, conductor repair sleeves, and joint inhibitor compound required to complete the conductor installation.

The Section B item "Stringing three 954,000-circular mil, ACSR, 45/7 nonspecular conductors" shall include furnishing, stringing, splicing, repairing, sagging, and clipping in the conductors, as described in this paragraph; installing jumper loops; and furnishing and installing all materials to complete the conductor installations, except for materials furnished and installed as a part of insulator assemblies.

Measurement for furnishing and stringing conductors will be made horizontally along the centerline of the transmission line.

b. MATERIALS:

(1) Conductor: The Contractor-furnished conductor shall be ACSR, and shall conform to the requirements of ASTM B 232, Table B, and the following:

TABLE B

SPECIAL CHARACTERISTICS

Completed conductor size (circular mil)	954,000	
Ultimate strength, as computed for the strength of the individual strands, not less than (pounds)	25,900	
Aluminum strands:		
Number	45	
Diameter (inch)	0.1456	
Steel strands:		
Number	7	
Diameter (inch)	0.0971	
*Standard lengths of conductor on each reel (feet)	9,990	
Random lengths, for a maximum of 10 percent of total amount furnished, not less than (feet)	5,000	

*Allowable minus tolerance 5 percent, no upper limit on length.

(a) General Characteristics: Each individual wire entering into the construction of the completed conductor shall conform to ASTM B 230. The core wire shall be Class A, galvanized-steel wire conforming to ASTM B 498 and B 500.

The conductor shall be nonspecular type having the outer surface treated to produce a dull finish in accordance with ANSI C7.69-1976 (R 1982).

(b) Raised Strand Limitation: The conductors shall be designed and fabricated to insure that all strands in the outer layer will remain the same distance (within a plus tolerance of 25 mils) from the center of the conductors before and after the conductors are strung.

(c) Packing and Shipping: The completed conductor shall be furnished on reels sufficiently sturdy in construction to withstand any normal service incident to shipping, hauling, and field erection of conductor. No random length shall be wound on the same reel with a specified standard length, and all reels on which random lengths are furnished shall be of the same overall width and shall have bushings of the same inside sleeve diameters as the reels for the specified standard conductor lengths.

(2) Conductor Joints and Repair Sleeves: The joints for splicing conductor shall be compression-type, shall include an overall aluminum alloy sleeve, and shall develop not less than 95 percent of the ultimate strength of the conductor. The conductivity of the completed splices shall be not less than that of the conductor.

Compression repair sleeves may be used in lieu of compression joints to repair minor damage to conductor provided that not more than one-third of the aluminum strands in the outer layer are damaged over a length of not more than 4 inches and the cross-sectional area of any damaged strand is not reduced by more than 25 percent, that there are no broken strands, and that there has been no damage to strands in other layers.

c. TESTS:

(1) Conductor Tests: During fabrication of the conductor, all physical tests shall be made in accordance with the requirements of ASTM.

In the event that the conductor is fabricated by two or more manufacturers, all tests shall be performed by each manufacturer.

d. SUBMITTALS: The contractor shall submit certification that the conductor meets all requirements of ASTM in accordance with the "Reports of Tests" paragraph of the "Drawings and Data" Subdivision.

e. INSTALLATION: Contractor's equipment and methods used for stringing conductors shall be subject to approval of Western and shall be such that conductors will not be scratched, grooved, kinked, twisted, abraded, or otherwise deformed and such that support structures will not be damaged. If the conductors are damaged, the Contractor shall repair or replace the damaged sections in a manner approved by the COTR and at no additional

cost to Western. All sections of conductors damaged by the application of gripping attachments shall be repaired or replaced before the conductors are sagged in place.

No stringing operations shall be conducted over any state highway on Saturdays, Sundays, or legal holidays.

All stringing operations shall be conducted so that at no time will any suspension attachment be subjected to longitudinal loads, and at no time will any tension tower be subjected to torsion resulting from longitudinal loads on opposing faces at opposite ends of crossarms. The vertical angles of pulling lines shall be such as to minimize, within practical limits, the vertical loading in structures and shall be subject to approval of the COTR.

Procedures used for stringing and sagging conductors, including special safety precautions when stringing adjacent to energized facilities and at powerline crossings, shall meet the minimum requirements set forth in the "Safety and Health Requirements" Subdivision of the "General Requirements" Division.

Portions of the transmission line will closely parallel existing energized transmission lines. During stringing operations, a buildup of voltage due to energized parallel facilities may result in safety hazards. The Contractor shall be responsible for familiarizing himself with the area and shall implement adequate safety measures when stringing conductors adjacent to energized facilities, particularly those located within 2 miles of the transmission line.

The conductors shall be strung by the controlled-tension method, except in certain isolated spans upon approval from the COTR, using neoprene-lined, double-bull-wheel-type tension stringing equipment.

The pulling lines shall be of sufficient length to avoid applying undue strain to the insulators and structures, and shall be connectd to the conductors with swivel connectors and stocking-type grips as directed by the COTR. The end of the grips (sock) shall be taped to the conductor so that the grips will run freely in the sheaves. Conductor splices shall not be passed through a sheave except as specifically permitted by the COTR. Reel stands shall be heavily constructed and provision shall be made for braking the reels. The conductor shall not be dragged over ground, rock, or fence wires, nor over any objects which may injure the conductor. Guards shall consist of material over which the conductor may slide without injury and shall be subject to the approval of the COTR.

The design, size, materials, and points of attachment of the stringing sheaves, and vertical angles of running lines shall be subject to approval of Western. The minimum diameter of the sheaves at the bottom of the groove shall be at least 12 times the diameter of the conductor with which it is used, and the size and shape of the groove shall conform to the

conductor manufacturer's recommendation. Sheaves shall be equipped with high-quality ball or roller bearings and shall have neoprene-lined grooves. The conductors shall not be allowed to hang in the stringing blocks more than 24 hours before being pulled to the specified sag. After being sagged, the conductors shall be allowed to hang in the stringing blocks for not less than 2 hours before being clipped in, to permit the conductor tension to equalize. The total time which the conductors are allowed to remain in the stringing blocks before being clipped in shall not be more than 72 hours. Notwithstanding the 72-hour limitation, pulling of any third conductor setup will not be allowed until the corresponding first conductor setup is clipped in.

In order to minimize the danger of failure, the design of the tension equipment shall be such that when the desired tension is obtained, the same constant tension will be held so long as the brakes are left at this setting, whether the brakes are actuated manually, pneumatically, hyraulically, or electrically. The equipment shall be so designed that there can be no conduction of heat generated by the braking action of the bull wheels. There shall be slight mechanical braking on the reels to prevent loose conductor between the reels and the bull wheels. The bull wheels shall have a neoprene lining not less than 1/4-inch thick and shall have a minimum outside diameter of 42 inches.

A minimum of 4 1/2 turns of conductor shall be placed around the bull wheels. The equipment shall be capable of maintaining a continuous tension of 7000 pounds per conductor. When stringing conductors by the controlled-tension method, the sag in each conductor shall be maintained at least 20 percent greater than the sags specified in the stringing sag tables, prior to final adjustment of the sag before clipping in the conductors.

The conductors shall not be prestretched and shall be sagged in accordance with sag tables which will be furnished to the Contractor after the Notice to Proceed has been issued. The length of conductor sagged in one operation shall be limited to the length that can be sagged satisfactorily but shall not exceed 16,000 feet. In sagging one-reel lengths, the sag of two spans shall be checked. The length of the spans used for checking shall be approximately equal to the ruling span. The sag of spans on both sides of all horizontal angles of more than 10° shall be checked. After the conductors have been pulled to the required sag, intermediate spans shall be inspected to determine whether the sags are uniform and correct.

Sagging operations shall not be carried on when, in the opinion of the COTR, wind, extremely low temperature, or other adverse weather conditions prevent satisfactory sagging. A tolerance of plus or minus 1/2-inch sag per 100 feet of span length, but not to exceed 6 inches in any one span, will be permitted when stringing is being done at temperatures of 0° F and above, and a tolerance of plus or minus 1/4 inch of sag per 100 feet of span length, but not to exceed 3 inches in any one span, will be permitted when stringing is being done at temperatures below 0° F; provided, that all conductors in the span assume the same sag and the necessary ground

clearance is obtained; provided further, that the conductor tension between successive sagging operations is equalized so that the suspension insulator assemblies will assume the proper position when the conductor is clipped in. After clipping in is completed, all suspension insulator strings shall hang vertically. Each phase of conductor shall be tied off, both ahead and back, at the last clipped structure of each sag setup, which tie-offs shall be left in place until the tie-offs of the subsequent setup are in place. Check the sag at all points to be checked. Furnish the necessary personnel for signaling and climbing purposes. Target all spans for sagging and Western may verify the sag at any point with the Contractor's equipment. At all suspension or tension structures, the conductors shall be attached to the insulator assemblies by suspension clamps or dead end fittings, in accordance with the "Conductor Insulator Assemblies" Subdivision. Conductor arrangements throughout the line shall be as shown on the plan-profile sheets or as specified by the COTR.

During the stringing operations, dirt or grease that can be readily observed on the conductors shall be removed by cleaning with clean cloths or brushes saturated with tetrachlorethylene or trichlorethylene. Proper precautions shall be taken by personnel cleaning the conductor to protect themselves against the toxic and drying actions of the chemical being used. The cleaning apparatus itself shall be kept clean such that particles collected during the conductor cleaning process do not scratch or mar subsequent conductor.

All joints and repair sleeves shall be located at least 25 feet away from the structures. No joints or repair sleeves shall be used in spans crossing over Interstate highways, railroad, communication lines, or utility lines of voltages greater than 15 kilovolts, or in the two spans adjoining the crossing span, without approval of the COTR. To develop rated mechanical strength and electrical conductivity, the installation of compression joints shall be carefully supervised to insure that the joints are centered properly. The distance between two joints, between two repair sleeves, or between a joint and a repair sleeve on any one conductor shall not be less than 4000 feet. Not more than one joint or repair sleeve will be permitted in any one conductor in any one span.

Conductor dead ends, joints, and repair sleeves shall be applied to conductors in accordance with the manufacturer's recommendations. Furnish filler paste and all necessary tools, including compressors required for applying compression splices.

Jumper connections shall be made with compression-type jumper terminals which shall be bolted to the compression-type dead ends. After the splices, dead ends, and jumper connectors are compressed onto the conductor, the contractor shall remove, by suitable means, any sharp edges or protrusions formed during the compression operations.

If necessary, insulator offset data shall be used so as to insure that suspension insulator strings hang in a vertical plane through the axis of the structure after the conductors are clipped in. If the Contractor

elects to have Western compute offset data, he shall submit a formal request to the Contracting Officer at least 2 weeks prior to stringing of each section of line for which offset data are required. The request shall include the beginning and ending stations for each continuous section to be strung.

4.4.2 OVERHEAD GROUND WIRE:

a. GENERAL: Provide all materials for overhead ground wires including the galvanized-steel strand wire and wire joints required to complete the overhead ground wire installation.

The special safety precautions during stringing near energized lines and the equipment methods and limitations used in stringing overhead ground wires shall be the same as those used in stringing conductors as described in the "Conductors" paragraph.

The Section B item "Stringing one 1/2-inch-diameter high-strength steel, 7-wire overhead ground wires" shall include furnishing, stringing, splicing, sagging, and clipping in the overhead ground wire, as described in this paragraph; and furnishing and installing all materials to complete the overhead ground wire installations, except for materials furnished and installed as a part of suspension and tension assemblies for overhead ground wires.

Measurement for furnishing and stringing the overhead ground wire will be made horizontally along the centerline of the transmission line.

b. MATERIALS:

(1) Overhead Ground Wire: The overhead ground wire shall be 7-wire, 1/2-inch-diameter, galvanized-steel strand conforming to high-strength grade, Class B steel strand in accordance with ASTM A 363.

The completed strand shall be furnished on reels sufficiently sturdy to withstand normal service incident to shipping, hauling, and field erection. The 1/2-inch-diameter strand shall be furnished in lengths not less than 5000 feet long, except that not more than 5 percent of the total length may be furnished in lengths of not less than 2500 feet.

(2) Overhead Ground Wire Joints: Joints used for splicing or repairing damaged overhead ground wire shall be compression-type, full tension joints. Use of repair sleeves is not permitted.

c. TESTS: All tests enumerated in ASTM A 363 shall be performed on samples taken at random from 10 percent of the reels of the completed galvanized-steel wire.

d. SUBMITTALS: Furnish data and test reports in accordance with the "Reports of Tests" paragraph.

e. STRINGING: The overhead ground wire shall be strung in accordance with conductor stringing requirements of the "Conductors" paragraph except that neoprene-lined or unlined sheaves may be used. Sheaves shall be at least 7 inches in diameter at the bottom of the groove.

4.4.3 VIBRATION DAMPERS:

a. GENERAL: Provide stockbridge-type vibration dampers for ACSR conductors and stockbridge-type or preformed spiral vibration dampers as manufactured by Preformed Line Products Company, P.O. Box 91129, Cleveland, OH 44101, Catalog Number SVD-5050105 or equal, for the steel-strand overhead ground wire. The Contractor shall bid for either, but not both, of the stockbridge or preformed types of dampers for the overhead ground wires.

The Section B items for vibration dampers for conductors and for overhead ground wires include furnishing all materials, and performing all work, including testing, required to furnish and install vibration dampers for ACSR conductors and steel-strand overhead ground wires.

b. MATERIALS: Stockbridge-type vibration dampers shall have an aluminum clamp compressed or cast onto the messenger wire between the weights, provided that the casting process, if used, shall meet or exceed the requirements of FF-B-575, Type II, Grade 5. All ferrous metal shall be galvanized in accordance with ASTM A 153. All metal shall be free from burrs, sharp edges, lumps, or dross, and shall be smooth so that interconnecting parts will fit properly and so that the parts may be assembled and disassembled readily. All threaded steel parts shall be galvanized after being threaded and excessive zinc shall be removed from the threads.

The dampers shall be suitable for installation directly on the conductors or the overhead ground wires as applicable as armor rods will not be used.

The damper clamp shall be designed to permit installation and removal by the use of hot-line tools.

c. TESTS:

(1) Aeolian Vibration Tests: Tests which demonstrate the effectiveness of vibration dampers in limiting the peak-to-peak bending amplitude, caused by aeolian vibration and as defined in the IEEE Task Force on Conductor Vibration (IEEE Paper No. 31 CP 65-156), to 10 mils for ACSR conductors and to 15 mils for steel-strand overhead ground wire shall be performed.

The tests shall be performed in suspension spans of the 600- to 900-foot length range with cable tensions not less than 20 percent of the cable nominal ultimate strengths and with vibration dampers installed at the manufacturer's recommended spacing, for each of the following cable sizes:

(a) ACSR conductor with diameter of 1.165 inches plus or minus 0.25 inch.

(b) Steel strand with diameter of 0.495-inch plus or minus 1/16 inch.

The test for each cable size shall be continued for a minimum of 3 weeks or until a full range of winds between 0 and 20 miles per hour and at right angles to the line have been recorded.

Laboratory tests which are equivalent to the above tests may be performed at the option of the Contractor.

d. SUBMITTALS: Submit data and results of the required tests in accordance with the "Drawings and Data" Subdivision. Additionally, obtain from the manufacturer, the vibration damper spacing that the manufacturer has determined from tests to be most effective in limiting bending amplitudes in accordance with subparagraph c.(1) above and for all the applications listed on drawing 12 (GTF-CON 1004), and shall submit that data to Western.

Certified reports showing results of previous tests which show that vibration dampers meet the requirements of these specifications may be substituted for the test results required above.

e. INSTALLATION: Vibration dampers shall be attached to conductors and to overhead ground wire as directed. Data showing spacing requirements will be furnished to the Contractor after the Contractor furnishes the damper manufacturer's recommendation to Western. The vibration dampers shall be fastened securely to the conductors and overhead ground wire in accordance with the manufacturer's instructions. All components shall be properly aligned and the installation completed with torque wrenches to insure that bolts are tightened to the torque values recommended by the manufacturer. Western will make spot checks of vibration damper installations, and if deficiencies are found, the Contractor shall correct the damper installations to the extent deemed necessary by the COTR.

Hang the stockbridge-type vibration dampers in a vertical plane and ascertain that any drain holes provided in damper weights are open after the dampers are installed. The vibration dampers for conductors shall be installed so that the head of the clamp bolt faces toward the structure to facilitate removal during hot-line maintenance.

4.4.4 HOLD-DOWN WEIGHTS

a. GENERAL: The Schedule B item "Hold-down weights, 50 pound" includes furnishing and installing hold-down weights in accordance with the plan and profile drawings and these specifications.

b. MATERIALS: The hold-down weights shall be 50-lb weights suitable for attaching directly to 954,000-circular mil, ACSR, 45/7 conductor

without armor rods. The weights shall be lead conductor weights as manufactured by NH Industries, Inc., P.O. Box 26141, Denver, CO 80226, or equal.

c. INSTALLATION: The hold-down weights shall be assembled and installed in accordance with the manufacturer's recommendations and the plan and profile drawings.

SUBDIVISION 4.5--APPROACH SPANS

4.5.1 APPROACH SPANS:

a. GENERAL: The Section B items pertaining to approach spans shall include furnishing, and if directed by the COTR assembling and installing, all materials required to complete the approach spans as follows:

(1) Approach Span to Great Falls Substation.
(2) Approach Span to Conrad Substation.
(3) Two Approach Spans to Bole Substation.

If materials are not installed, they shall be suitably packaged and delivered to Western as directed by the COTR.

b. MATERIALS: All materials furnished shall be in accordance with the requirements for identical materials as specified elsewhere in these specifications.

(1) Twenty four single string conductor tension insulator assemblies as shown on drawing 16 (41 1001) with 15 insulator units each of 40,000 pound M&E strength. The assemblies shall be complete including the compression dead ends for 954,000 - circular mil, ACSR 45/7 conductor.

(2) Eight overhead ground wire tension assemblies as shown on drawing 20 (41 1006). The assemblies shall be complete including compression dead ends for 1/2-inch diameter high strength steel overhead ground wire.

(3) Four overhead ground wire tension assemblies each using a steel yoke as shown on drawings 14 (GTF-CON T100). The assemblies shall be complete including two compression dead ends for 1/2-inch diameter high strength steel overhead ground wire.

(4) Three lengths of approximately 1650 feet each of 954,000 circular mil, ACSR, 45/7, nonspecular type conductor.

(5) Two lengths of approximately 1650 feet each of 1/2-inch diameter high strength steel overhead ground wire.

c. INSTALLATION: Assemble and install all materials for the approach spans in accordance with the applicable paragraphs for identical or similar materials as detailed elsewhere in these specifications and as directed by the COTR.

(1) Perform the following work if directed by the COTR to complete the approach span of Great Falls-Conrad 230-kV line at Great Falls Substation:

(a) Assemble and install three single-string conductor tension insulator assemblies as described in subparagraph b(1) above on the dead end structure Type 28D at Sta. 10+00 of Great Falls-Conrad 230-kV Transmission Line.

(b) Assemble and install one overhead ground wire tension assembly using a steel yoke as described in subparagraph b(3) above on the dead end structure Type 28D at Sta. 10+00 of Great Falls-Conrad 230-kV Transmission Line.

(c) Assemble and install three single-string conductor tension insulator assemblies as described in subparagraph b(1) above on the take off structure for the Great Falls-Conrad 230-kV line.

(d) Assemble and install two overhead ground wire tension assemblies as described in subparagraph b(2) above on the take off structure for the Great Falls-Conrad 230-kV line.

(e) String three approximately 600-foot lengths of 954,000 - circular mil, ACSR, 45/7 nonspecular conductor and two apprximately 600 foot lengths of 1/2-inch-diameter high strength steel overhead ground wire from the take off structure to Type 28D structure at Sta. 10+00 as described in subparagraph b(4) and b(5) above.

(2) Perform the following work, if directed by the COTR, to complete two approach spans of Great Falls-Conrad line at Bole Substation:

(a) Assemble and install three single-string conductor tension insulator assemblies, as described in subparagraph b(1) above on the dead end structure Type 28D at Sta. 2274+50 of Great Falls-Conrad 230-kV Transmission Line.

(b) Assemble and install one overhead ground wire tension assembly using a steel yoke as described in subparagraph b(3) above on the dead end structure Type 28D at Sta. 2274+50 of Great Falls-Conrad 230-kV Transmission Line.

(c) Assemble and install three single-string conductor tension insulator assemblies as described in subparagraph b(1) above on the take off structure at Sta. 2276+95.77 for the Great Falls-Conrad 230-kV line.

(d) Assemble and install two overhead ground wire tension assemblies as described in subparagraph b(2) above on the takeoff structure for the Great Falls-Conrad 230-kV line.

(e) String three approximately 275-foot lengths of 954,000-circular mil, ACSR, 45/7 nonspecular conductor and two 275-foot lengths of 1/2-inch diameter high strength steel overhead ground wire from the take off structure at Sta. 2276+95.77 to Type 28D structure at Sta. 2274+50 as described in subparagraph b(4) and b(5) above.

(f) Assemble and install three single-string conductor tension insulator assemblies as described in subparagraph b(1) above on the dead end structure Type 28D at Sta. 2281+00 of Great Falls-Conrad 230-kV Transmission Line.

(g) Assemble and install one overhead ground wire tension assembly using a steel yoke as described in subparagraph b(3) above at the dead end structure Type 28D at Sta. 2281+00 of Great Falls-Conrad 230-kV Transmission Line.

(h) Assemble and install three single-string conductor tension insulator assemblies as described in subparagraph b(1) above in the take off structure at Sta. 2278+45.77 of Great Falls-Conrad 230-kV line.

(i) Assemble and install two overhead ground wire tension assemblies as described in subparagraph b(2) above on the take off structure at Sta. 2278+45.77 for the Great Falls-Conrad 230-kV line.

(j) String three approximately 275-foot lengths of 954,000-circular mil, ACSR, 45/7 nonspecular conductor and two approximately 275-foot lengths of 1/2-inch diameter high-strength steel overhead ground wire from the take off structure at Sta. 2278+45.77 to Type 28D structure at Sta. 2281+00 as described in subparagraphs b(4) and b(5) above.

(3) Perform the following work, if directed by the COTR, to complete one approach span of Great Falls-Conrad line at Conrad Substation:

(a) Assemble and install three single-string conductor tension insulator assemblies, as described in subparagraph b(1) above on the dead end structure Type 28D at Sta. 3858+80 of Great Falls-Conrad 230-kV Transmission Line.

(b) Assemble and install one overhead ground wire tension assembly using a steel yoke as described in subparagraph b(3) above on the dead end structure Type 28D at Sta. 3858+80 of Great Falls-Conrad 230-kV Transmission Line.

(c) Assemble and install three single-string conductor tension insulator assemblies as described in subparagraph b(1) above on the take off structure for the Great Falls-Conrad 230-kV line.

(d) Assemble and install two overhead ground wire tension assemblies as described in subparagraph b(2) above on the take off structure for the Great Falls-Conrad 230-kV line.

(e) String three approximately 400-foot lengths of 954,000-circular mil, ACSR, 45/7 nonspecular conductor and two 400-foot lengths of 1/2-inch diameter high strength steel overhead ground wire from the take off to Type 28D structure at Sta. 3858+80 of Great Falls-Conrad 230-kV line as described in subparagraphs b(4) and b(5) above.

SUBDIVISION 4.6--DRAWINGS, DATA, AND TEST REPORTS

4.6.1 GENERAL:

All work required by this paragraph shall be included in items of Section B for the applicable work for which the drawings, data, and test reports are required.

4.6.2 DRAWINGS AND DATA:

As soon as practicable after award of contract, furnish to Western Area Power Administration, P.O. Box 3402, Golden, CO 80401, Attention: Code A2100, and to the COTR, for information, three sets each of catalog data sheets of accessories and hardware used in conductor and overhead ground wire installation, three sets of drawings showing the complete insulator and overhead ground wire assemblies and details of all hardware and fittings used in the assemblies; and a complete materials list showing the name of the manufacturer and the manufacturer's catalog number, or type, for each item of material as listed below that he will furnish in accordance with the requirements of these specifications and tabulated in a manner similar to that indicated on the following page.

MATERIALS	MANUFACTURER	CATALOG NO. OR TYPE
Conductor:		
954,000 circular mil, 45/7 ACSR		
Steel-strand overhead ground wire, 1/2-inch high-strength 7-strand		
Insulator, suspension type as follows:		
20,000-pound units		
40,000-pound units		
Suspension clamps to fit:		
954,000 circular mil, ACSR, 45/7 conductors without armor rods		
Suspension clamps for 1/2-inch steel strand overhead ground wire without armor rods.		
Vibration dampers for:		
attaching directly to 954,000 circular mil, 45/7 ACSR conductors		

MATERIALS	MANUFACTURER	CATALOG NO. OR TYPE
attaching directly to 1/2-inch steel strand		
Compression dead ends for:		
954,000 circular mil, ACSR, 45/7 conductors		
1/2-inch steel strand overhead ground wire		
Compression joint for:		
954,000 circular mil, ACSR, 45/7 conductors		
1/2-inch steel strand overhead ground wire		
Turnbuckles for use with dead end assemblies which support:		
954,000 circular mil, ACSR, 45/7 conductors		
1/2-inch steel strand overhead ground wire		

4.6.3 REPORTS OF TESTS:

As soon as practicable after completion of individual tests, furnish to the Western Area Power Administration, P.O. Box 3402, Golden, CO 80401, Attention: Code A2100, for information, two certified copies of records or results of tests as follows:

a. INSULATORS: In accordance with subparagraph b. of the "Submittals" paragraph of the "Conductor Insulator Assemblies" Subdivision as follows:

(1) Suspension Insulator Units;
(2) Line Post Insulators;
(3) Polymer-Fiberglass Insulators;
(4) Compression Dead Ends.

b. CONDUCTOR: Certification that the conductor meets all requirements of ASTM.

c. OVERHEAD GROUND WIRE: Certification that the overhead ground wire meets all requirements of ASTM.

d. COMPRESSION DEAD ENDS FOR OVERHEAD GROUNDWIRE: In accordance with subparagraph a(4) of the "Materials and Installation" paragraph of the "Accessories for Steel or Concrete Structure" Subdivision.

e. VIBRATION DAMPERS: In accordance with subparagraph d. of the "Vibration Dampers" paragraph of the "Conductor, Overhead Ground Wire, and Accessories" Subdivision.

* * * * * *

DIVISION 5 - DRAWINGS

SUBDIVISION 5.1--DRAWINGS

5.1.1 DRAWINGS, GENERAL:

a. GENERAL: The drawings included in these specifications are reduced reproductions and are not to scale. Some of the drawings included herein show details of fabrication, and other details and information not a part of work required under these specifications. Such information and details which are not applicable under these specifications shall be disregarded. Where details shown on Standard Drawings differ from other drawings included herein or from these specifications, the details of other drawings or requirements of these specifications shall govern. Reference drawings referred to on specifications drawings, and not included herein, are not necessary for bidding purposes but will be furnished to the Contractor for construction purposes. In the event there are minor differences as determined by Western, between details and dimensions shown on the drawings included herein and those of existing features at the site, the details and dimensions of existing features at the site shall govern. The Contractor shall check all drawings carefully and advise Western of any errors or omissions discovered.

The parts of the work for which dimensions are not shown have been drawn to scale as nearly to final dimensions as possible prior to the purchase of machinery or equipment and prior to the development of final general and detailed designs.

b. ADDITIONAL OR REVISED DRAWINGS: Except as otherwise provided in these specifications for drawings to be furnished by the contractor, the specifications drawings will be supplemented by such additional or revised general and detail drawings as may be necessary as the work progresses; and the Contractor shall do no work without proper drawings and instructions. The additional or revised general and detailed drawings furnished by Western will show dimensions and details necessary for construction purposes more completely than are shown on the specifications drawings for features of the work and for equipment and other metalwork not yet purchased. The Contractor will be required to perform the work in accordance with the additional general and detail drawings or revisions furnished by Western at the applicable prices bid in Section B.

c. ADDITIONAL COPIES OF DRAWINGS: After award of contract, Western will furnish additional copies of the specifications, which include reduced-size drawings. Four full-size contact prints and one reproducible of the original drawings from which the reduced size reproductions were made will be furnished to the Contractor for construction purposes.

d. PLAN AND PROFILE DRAWINGS, SAG TABLES, AND CHARTS: Plan and profile drawings, sag tables, and charts, and other drawings required for construction will be furnished to the Contractor as soon as possible after award of contract.

Preliminary plan and profile drawings are available for inspection by prospective bidders at the Western Area Power Administration, Office of Construction and Inspection, Denver West, Building 18, 1627 Cole Boulevard, Golden, CO, and at Western Area Power Administration, Assistant Area Manager for Construction, 200 4th St., SW, Huron, South Dakota.

Full-size or half-size prints will be mailed to bidders upon request. Bidders will be charged $2.00 per print, not refundable, which charge will include U.S. postage.

5.1.2 LIST OF DRAWINGS:

The following drawings are made a part of these specifications:

GREAT FALLS - CONRAD
230-KV TRANSMISSION LINE

LOCATION MAP:

1. GTF-CON-0013 - Key Map (Sheet 1 of 2)
2. GTF-CON-0014 - Key Map (Sheet 2 of 2)

TRANSMISSION LINE STRUCTURES:

2a. 43-28 2050 - Type 28 Poles - Guying Restrictions
3. 43-28 2200 - Type 28 Poles - Climbing Provisions
4. 43-28L 2200 - 28L Poles - Outline and Design Loads
5. 43-28S 2200 - 28S Poles - Outline and Design Loads
6. 43-28X 2200 - 28X Poles - Outline and Design Loads
7. 43-28A 2200 - 28A Poles - Outline and Design Loads
8. 43-28B 2200 - 28B Poles - Outline and Design Loads
9. 43-28C 2200 - 28C Poles - Outline and Design Loads
10. 43-28D 2200 - 28D Poles - Outline and Design Loads
11. 43-28N 2200 - 28N Poles - Outline and Design Loads

ELECTRICAL:

12. GTF-CON 1004 - Vibration Damper, Location, and Attachment Details
13. GTF-CON 1003 - Clearance Patterns
14. GTF-CON T100 - Material Attachment Details for Steel/Concrete Pole Structures
15. GTF-CON 1001 - V-String Assembly-Materials and Attachment Details

STANDARD DRAWINGS:

16. 41 1001 - Insulator Assembly Details for Steel Towers
17. 41 1003 - Insulator Hardware Details
18. 41 1004 - Strain Yokes and Yoke Assemblies
19. 41 1005 - Steel Towers Conductor and Overhead Ground Wire Hardware Details

20. 41 1006 - Steel Tower Overhead and Ground Wire Attachment Detail
21. 41 1011 - Fence Grounding Hardware
22. 41 1015 - Grounding Details for Concrete and Steel Poles
23. 41 9002 - Barbed Wire Gate for Right-Of-Way Fences
24. 41 9003 - Electric Barbed Wire Gate for Right-Of-Way Fences
25. 41 9005 - Aerial Patrol Number Signs for Steel Towers - Details and Locations
26. 41 9007 - Structure Number Signs - Details and Location
27. 41 9020 - Barbed Wire Gate for Off Right-Of-Way Access Fences

GEOLOGY:

28. GTF-CON 8000 - Geologic and Explorations Location Map
29. GTF-CON 8001 - Geologic and Explorations Location Map
30. GTF-CON 8002 - Geologic and Explorations Location Map
31. GTF-CON 8003 - Geologic and Explorations Location Map
32. GTF-CON 8004 - Geologic Log PR83-5
33. GTF-CON 8005 - Geologic Log PR83-10
34. GTF-CON 8006 - Geologic Log AP83-20
35. GTF-CON 8007 - Geologic Log AP83-25
36. GTF-CON 8008 - Geologic Log AP83-30
37. GTF-CON 8009 - Geologic Log AP83-35
38. GTF-CON 8010 - Geologic Log AP83-40
39. GTF-CON 8011 - Geologic Log AP83-45
40. GTF-CON 8012 - Geologic Log AP83-50
41. GTF-CON 8013 - Geologic Log AP83-55
42. GTF-CON 8014 - Geologic Log AP83-56
43. GTF-CON 8015 - Geologic Log AP83-57
44. GTF-CON 8016 - Geologic Log AP83-60
45. GTF-CON 8017 - Geologic Log AP83-65
46. GTF-CON 8018 - Geologic Log AP83-66
47. GTF-CON 8019 - Geologic Log PR83-70
48. GTF-CON 8020 - Geologic Log PR83-75
49. GTF-CON 8021 - Geologic Log PR83-80
50. GTF-CON 8022 - Geologic Log AP83-85
51. GTF-CON 8023 - Geologic Log AP83-90
52. GTF-CON 8024 - Geologic Log AP83-95
53. GTF-CON 8025 - Geologic Log AP83-100
54. GTF-CON 8026 - Geologic Log AP83-105
55. GTF-CON 8027 - Geologic Log PR83-110
56. GTF-CON 8028 - Geologic Log PR83-115
57. GTF-CON 8029 - Geologic Log PR83-120
58. GTF-CON 8030 - Geologic Log PR83-125
59. GTF-CON 8031 - Geologic Log PR83-130
60. GTF-CON 8032 - Geologic Log AP83-135
61. GTF-CON 8033 - Geologic Log AP83-140
62. GTF-CON 8034 - Geologic Log AP83-145
63. GTF-CON 8035 - Geologic Log AP83-150
64. GTF-CON 8036 - Geologic Log AP83-155
65. GTF-CON 8037 - Geologic Log PR83-160

66. GTF-CON 8038 - Geologic Log AP83-165
67. GTF-CON 8039 - Geologic Log AP83-170
68. GTF-CON 8040 - Geologic Log PR83-175
69. GTF-CON 8041 - Geologic Log AP83-180
70. GTF-CON 8042 - Geologic Log AP83-185
71. GTF-CON 8043 - Geologic Log PR83-190
72. GTF-CON 8044 - Geologic Log AP83-195
73. GTF-CON 8045 - Geologic Log AP83-200
74. GTF-CON 8046 - Geologic Log AP83-201
75. GTF-CON 8047 - Geologic Log AP83-205
76. GTF-CON 8048 - Geologic Log AP83-210
77. GTF-CON 8049 - Geologic Log AP83-215
78. GTF-CON 8050 - Geologic Log AP83-220
79. GTF-CON 8051 - Geologic Log AP83-225
80. GTF-CON 8052 - Geologic Log AP83-226
81. GTF-CON 8053 - Geologic Log AP83-227
82. GTF-CON 8054 - Geologic Log AP83-228
83. GTF-CON 8055 - Geologic Log AP83-230
84. GTF-CON 8056 - Geologic Log AP83-235
85. GTF-CON 8057 - Geologic Log PR83-240
86. GTF-CON 8058 - Geologic Log PR83-245
87. GTF-CON 8059 - Geologic Log AP83-250
88. GTF-CON 8060 - Geologic Log AP83-255
89. GTF-CON 8061 - Geologic Log PR83-260
90. GTF-CON 8062 - Geologic Log PR83-265
91. GTF-CON 8063 - Geologic Log AP83-270
92. GTF-CON 8064 - Geologic Log PR83-275
93. GTF-CON 8065 - Geologic Log AP83-280
94. GTF-CON 8066 - Geologic Log PR83-290
95. GTF-CON 8067 - Geologic Log AP83-295
96. GTF-CON 8068 - Geologic Log PR83-300
97. GTF-CON 8069 - Geologic Log PR83-305
98. GTF-CON 8070 - Geologic Log AP83-310
99. GTF-CON 8071 - Geologic Log AP83-315
100. GTF-CON 8072 - Geologic Log AP83-320
101. GTF-CON 8073 - Geologic Log PR83-325
102. GTF-CON 8074 - Geologic Log AP83-330
103. GTF-CON 8075 - Geologic Log PR83-335
104. GTF-CON 8076 - Geologic Log AP83-336
105. GTF-CON 8077 - Geologic Log AP83-340
106. GTF-CON 8078 - Geologic Log AP83-341
107. GTF-CON 8079 - Geologic Log PR83-345
108. GTF-CON 8080 - Geologic Log PR83-350
109. GTF-CON 8081 - Geologic Log AP83-355
110. GTF-CON 8082 - Geologic Log AP83-360
111. GTF-CON 8083 - Geologic Log AP83-361
112. GTF-CON 8084 - Geologic Log AP83-365
113. GTF-CON 8085 - Geologic Log AP83-370
114. GTF-CON 8086 - Geologic Log AP83-375
115. GTF-CON 8087 - Geologic Log AP83-390

116. GTF-CON 8088 - Geologic Log AP83-391
117. GTF-CON 8089 - Geologic Log AP83-395
118. GTF-CON 8090 - Geologic Log AP83-400
119. GTF-CON 8091 - Geologic Log AP83-405
120. GTF-CON 8092 - Geologic Log AP83-410
121. GTF-CON 8093 - Geologic Log AP83-415
122. GTF-CON 8094 - Geologic Log AP83-420
123. GTF-CON 8095 - Geologic Log PR83-425
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126. GTF-CON 8098 - Geologic Log PR83-430
127. GTF-CON 8099 - Geologic Log AP83-431
128. GTF-CON 8100 - Geologic Log PR83-435
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130. GTF-CON 8102 - Geologic Log AP83-441
131. GTF-CON 8103 - Geologic Log AP83-442
132. GTF-CON 8104 - Geologic Log AP83-445
133. GTF-CON 8105 - Geologic Log AP83-450
134. GTF-CON 8106 - Geologic Log AP83-455
135. GTF-CON 8107 - Geologic Log PR83-460
136. GTF-CON 8108 - Geologic Log AP83-461
137. GTF-CON 8109 - Geologic Log PR83-465
138. GTF-CON 8110 - Geologic Log AP83-466
139. GTF-CON 8111 - Geologic Log PR83-470
140. GTF-CON 8112 - Geologic Log AP83-475
141. GTF-CON 8113 - Geologic Log AP83-476
142. GTF-CON 8114 - Geologic Log PR83-480
143. GTF-CON 8115 - Geologic Log AP83-481
144. GTF-CON 8116 - Geologic Log AP83-482

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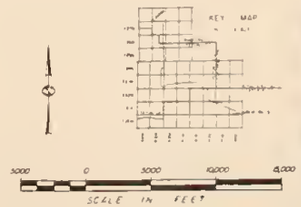


HORIZONS, INC.

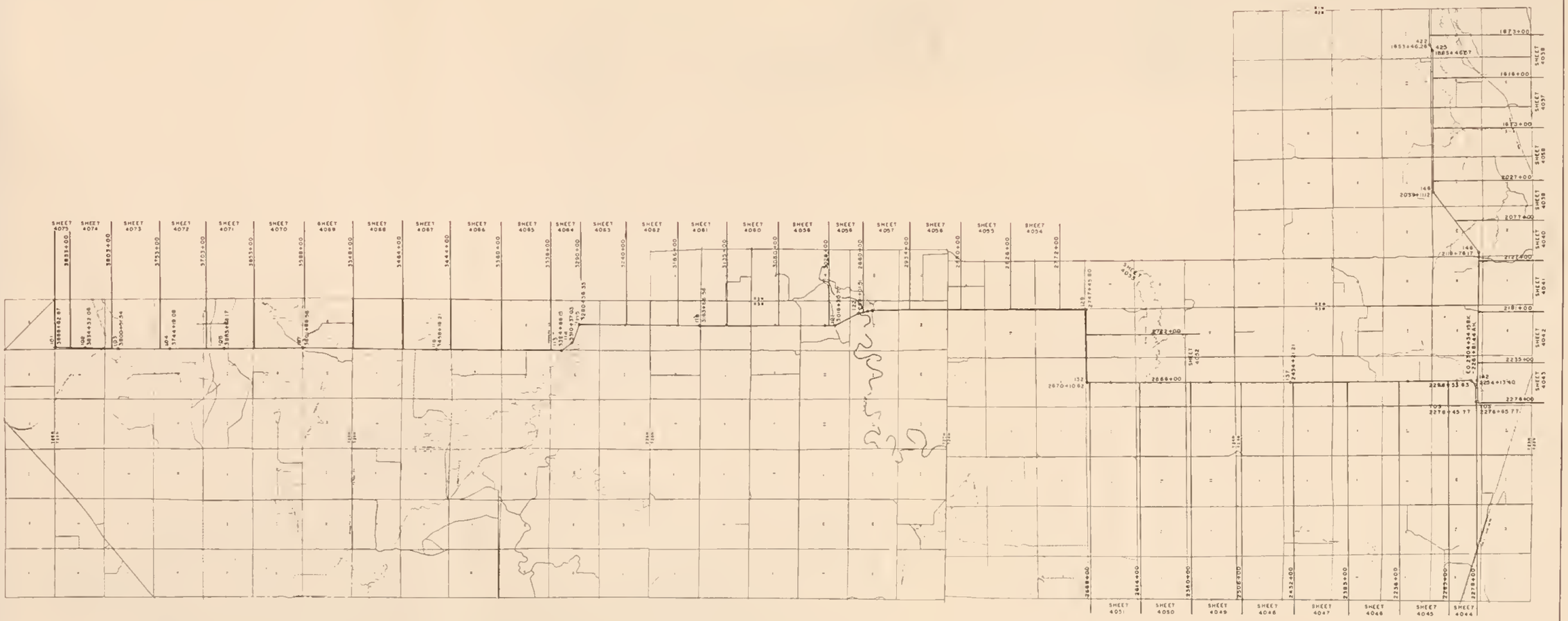
ALWAYS THINK SAFETY

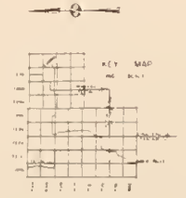
UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
BILLINGS CONSTRUCTION – HURON, SOUTH DAKOTA

GREAT FALLS - CONRAD – MONTANA 230-KV TRANSMISSION LINE KEY MAP

DESIGNED _____ RECOMMENDED _____
DRAWN _____ APPROVED Lloyd P. Frank
CHECKED _____ ASST AREA MGR FOR CONST

NOV 4,1983	GTF-CON	0013





3000 0 3000 6000 9000

SCALE IN FEET

HORIZONS, INC.

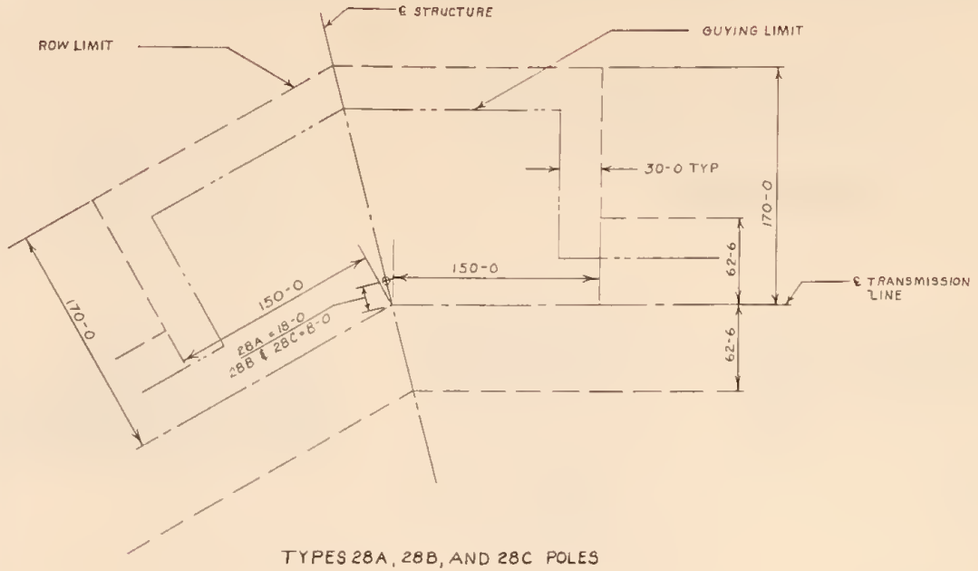
ALWAYS THINK SAFETY

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
BILLINGS CONSTRUCTION – HURON, SOUTH DAKOTA

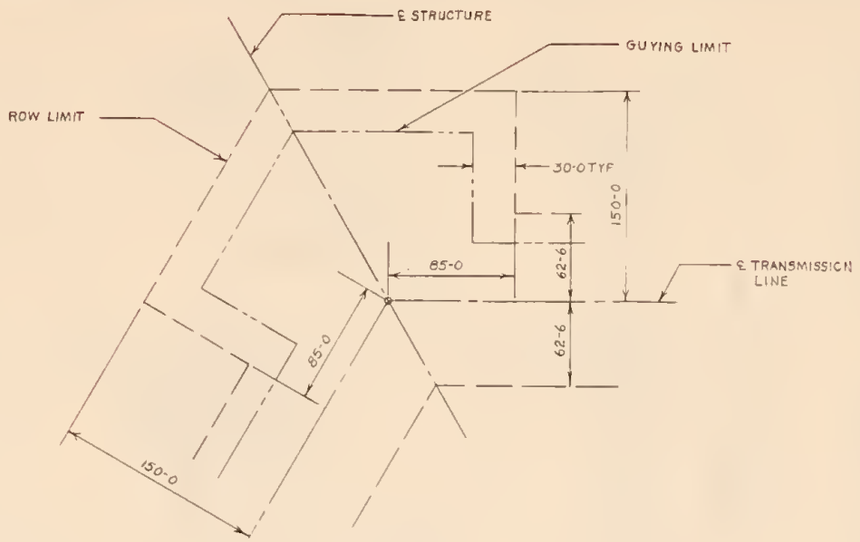
GREAT FALLS - CONRAD – MONTANA 230-KV TRANSMISSION LINE
KEY MAP

DESIGNED _____ RECOMMENDED _____
DRAWN _____ APPROVED _____ ASST. AREA MGR. FOR CONST
CHECKED _____

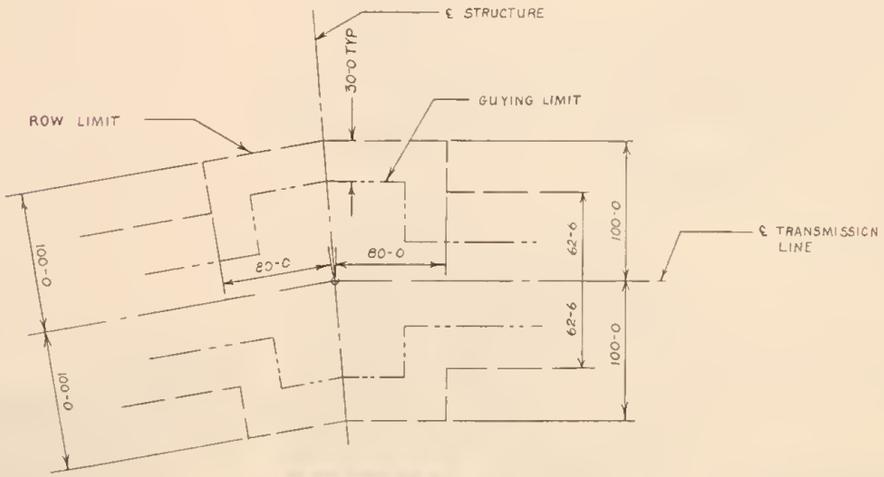
NOV. 4, 1983	GTF-CON	0014



TYPES 28A, 28B, AND 28C POLES



TYPE 28N POLE



TYPE 28D POLE

GENERAL NOTES

LOCATE GUY TO GUY ANCHOR ATTACHMENTS WITHIN THE GUYING LIMITS SHOWN.
GUYS ARE NOT REQUIRED ON TYPES 28L, 28X, AND 28S POLES.

REFERENCE DRAWINGS

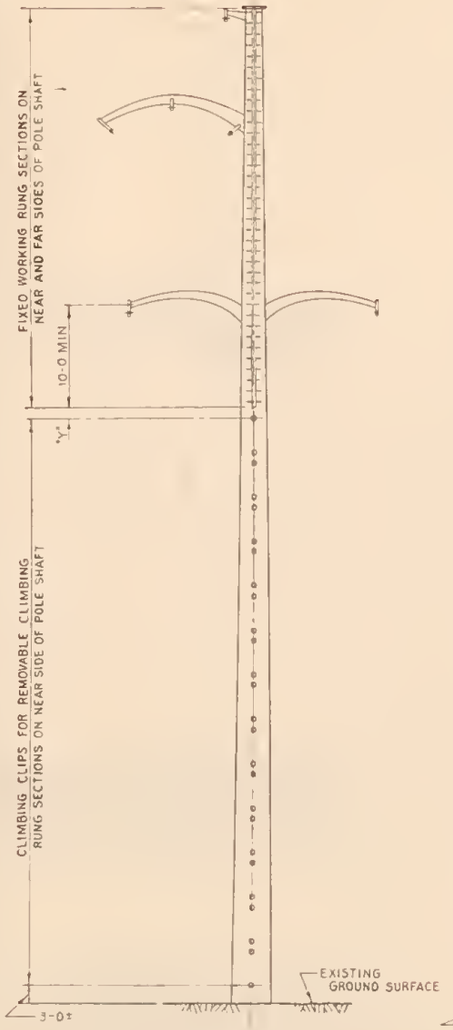
28A POLES - OUTLINE AND DESIGN LOADS ... 43-28A 2200
28B POLES - OUTLINE AND DESIGN LOADS ... 43-28B 2200
28C POLES - OUTLINE AND DESIGN LOADS ... 43-28C 2200
28D POLES - OUTLINE AND DESIGN LOADS ... 43-28D 2200
28N POLES - OUTLINE AND DESIGN LOADS ... 43-28N 2200

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS — GOLDEN, COLORADO

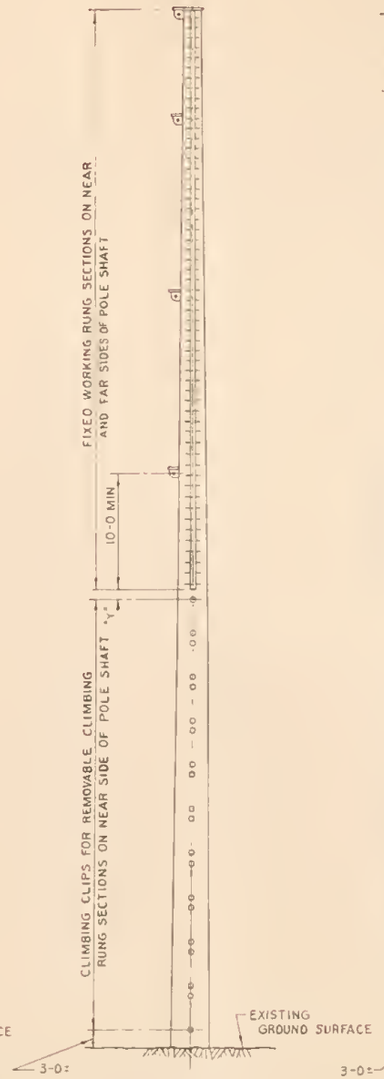
TRANSMISSION LINE STRUCTURES
TYPE 28 POLES
GUYING RESTRICTIONS

DESIGNED R.D. Hayes — RECOMMENDED J. B. Hanson
DRAWN D. W. Hanson — APPROVED R. W. Cobble, DIRECTOR, DIVISION OF CIVIL DESIGN
CHECKED [illegible]

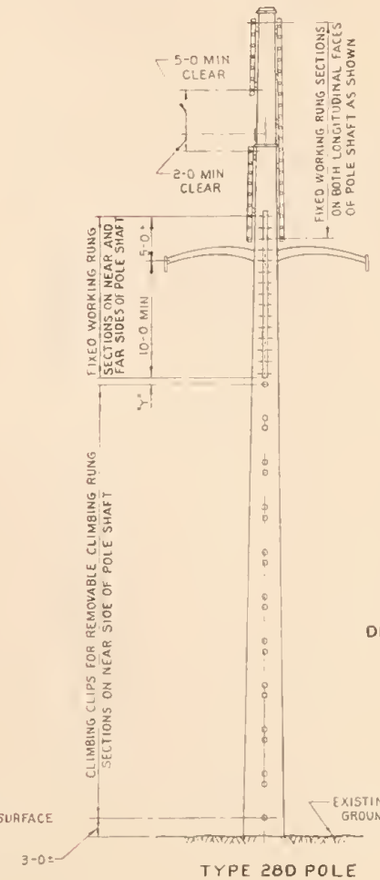
APRIL 23, 1984	43-28	2050


FIXED WORKING RUNG SECTIONS ON NEAR AND FAR SIDES OF POLE SHAFT
10'-0 MIN
"Y"
CLIMBING CLIPS FOR REMOVABLE CLIMBING RUNG SECTIONS ON NEAR SIDE OF POLE SHAFT
EXISTING GROUND SURFACE
3'-0±

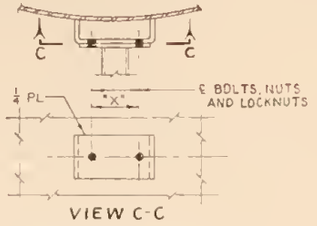
TYPES 28L, 28S AND 28X POLES


FIXED WORKING RUNG SECTIONS ON NEAR AND FAR SIDES OF POLE SHAFT
10'-0 MIN
"Y"
CLIMBING CLIPS FOR REMOVABLE CLIMBING RUNG SECTIONS ON NEAR SIDE OF POLE SHAFT
EXISTING GROUND SURFACE
3'-0±

TYPE 28C POLE
(TYPES 28A, 28B AND 28N POLES SIMILAR)

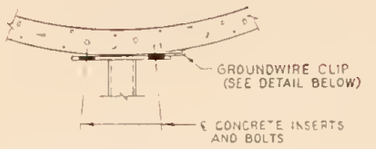

5'-0 MIN CLEAR
2'-0 MIN CLEAR
FIXED WORKING RUNG SECTIONS ON BOTH LONGITUDINAL FACES OF POLE SHAFT AS SHOWN
5'-0"
FIXED WORKING RUNG SECTIONS ON NEAR AND FAR SIDES OF POLE SHAFT
10'-0 MIN
"Y"
CLIMBING CLIPS FOR REMOVABLE CLIMBING RUNG SECTIONS ON NEAR SIDE OF POLE SHAFT
EXISTING GROUND SURFACE
3'-0±

TYPE 28D POLE

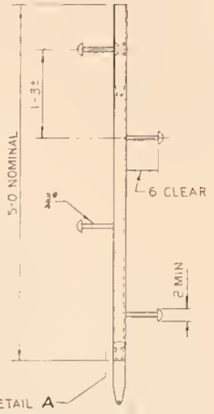


VIEW C-C

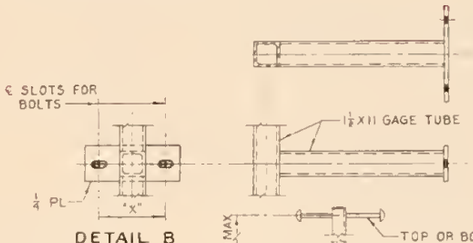
FIXED WORKING RUNG ATTACHMENT DETAIL (STEEL POLES)



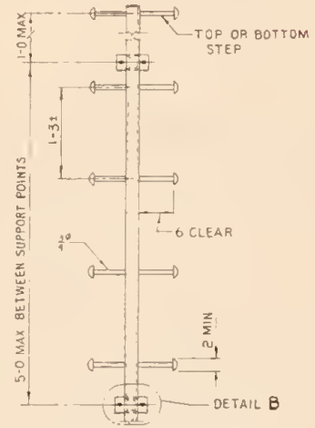
FIXED WORKING RUNG ATTACHMENT DETAIL (CONCRETE POLES)



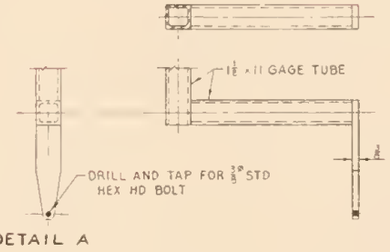
TYPICAL REMOVABLE CLIMBING RUNG SECTION

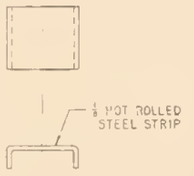


DETAIL B

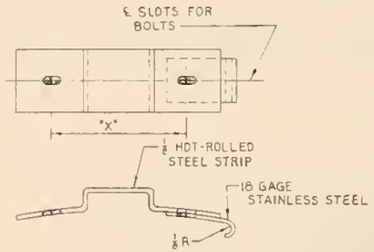


TYPICAL FIXED WORKING RUNG SECTION





CLIMBING CLIP FOR REMOVABLE CLIMBING RUNG SECTION (STEEL POLES)



CLIMBING AND GROUNDWIRE CLIP FOR REMOVABLE CLIMBING RUNG SECTION (CONCRETE POLES)

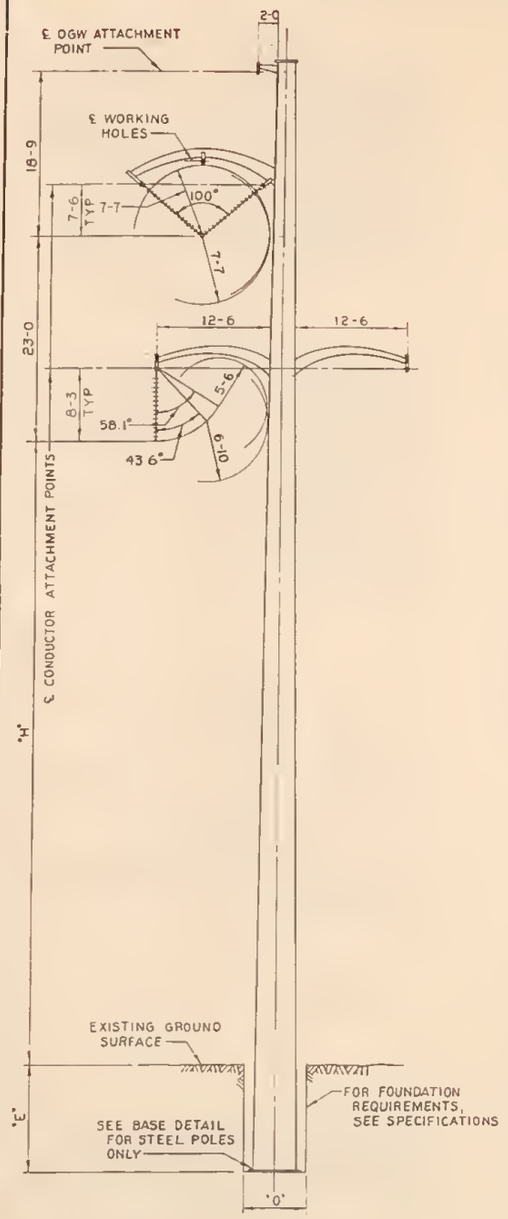
NOTES

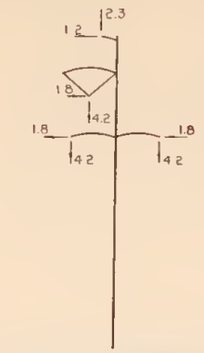
GALVANIZE ALL MATERIAL AFTER FABRICATION.
"X" DIMENSIONS TO BE EQUAL.
"Y" DIMENSION TO BE MIN NEEDED TO INSTALL TOP REMOVABLE CLIMBING RUNG SECTION

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS — GOLDEN, COLORADO

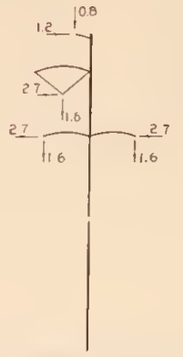
TRANSMISSION LINE STRUCTURES
TYPE 28 POLES
CLIMBING PROVISIONS

DESIGNED		RECOMMENDED	
DRAWN	G. R. Maude	APPROVED	DIRECTOR, DIVISION OF CIVIL DESIGN
CHECKED			
APRIL 23, 1984		43-28	2200

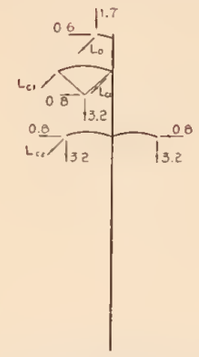




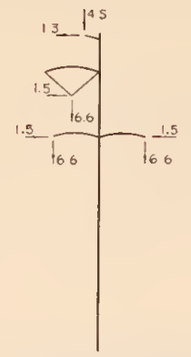
CASE A - NESC HEAVY
WIND ON POLE = 10 PSF
DEAD LOAD OF POLE x 1.5



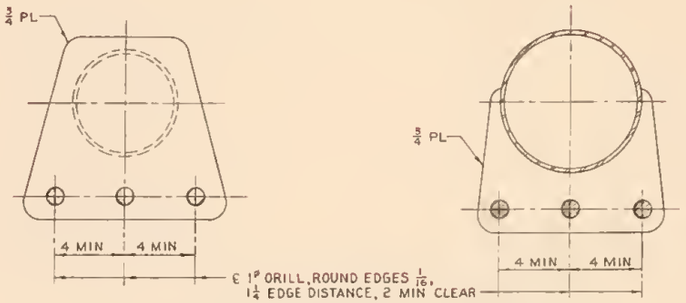
CASE B - HIGH WIND
WIND ON POLE = 37 PSF
DEAD LOAD OF POLE x 1.1



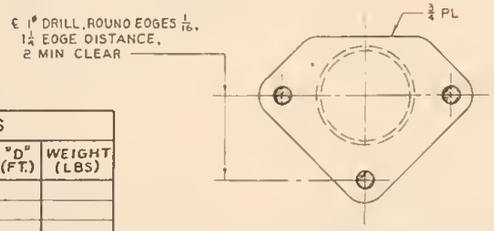
CASE C - LONGITUDINAL UNBALANCE
WIND ON POLE = 5 PSF
DEAD LOAD OF POLE x 1.1
CASE C1: L_o=5.1, L_{c1}=0, L_{c2}=0
CASE C2: L_o=0, L_{c1}=4.0, L_{c2}=0
CASE C3: L_o=0, L_{c1}=0, L_{c2}=7.9



CASE D - RIME ICE
WIND ON POLE = 5 PSF
DEAD LOAD OF POLE x 1.1

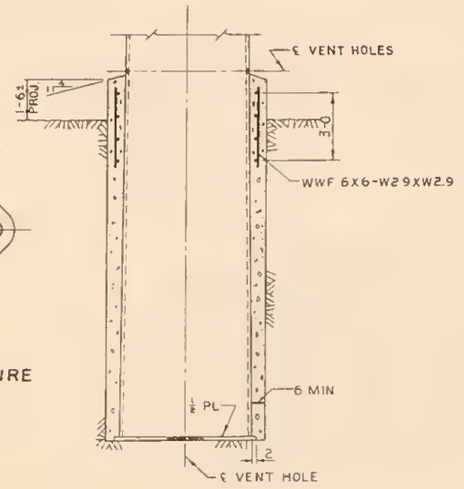


TYPICAL CONDUCTOR ATTACHMENTS AND WORKING HOLE ATTACHMENTS



TYPICAL GROUNDWIRE ATTACHMENT

TYPE 28L POLES				
DESIGNATION	"H" (FT.)	"E" (FT.)	"D" (FT.)	WEIGHT (LBS)
28L-55	55-0			
28L-60	60-0			
28L-65	65-0			
28L-70	70-0			
28L-75	75-0			
28L-80	80-0			



BASE DETAIL FOR STEEL POLES ONLY

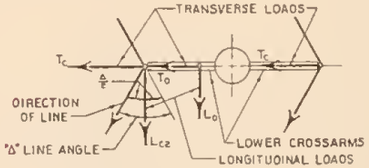
DESIGN NOTES

ALL LOADS SHOWN ARE ULTIMATE VALUES AND INCLUDE OVERLOAD FACTORS
WIRE LOADS ARE IN KIPS AND ARE TOTAL FOR AHEAD AND BACK SPANS.
THE POLES AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF DEAD LOAD, WIND LOAD ON THE POLE, AND THE WIRE LOADS FOR EACH LOADING CASE
THE STRUCTURE SHALL BE DESIGNED SELF-SUPPORTING; GUYS ARE NOT PERMITTED.
WIND PRESSURES SHOWN ON LOADING DIAGRAMS ARE BASED ON A SHAPE FACTOR OF 1.0 FOR CIRCULAR SECTIONS. FOR SECTIONS OTHER THAN CIRCULAR, MULTIPLY THE PRESSURES BY THE FOLLOWING SHAPE FACTORS:

ELLIPTICAL = 1.2 (MAJOR AXIS)
= 0.91 (MINOR AXIS)
12-S10E0 = 1.1
8-S10E0 = 1.3
6-S10E0 = 1.4
4-S10E0 = 1.6

DESIGN LOADS ARE BASED ON 954 KCM ACSR 45/7 "RAIL" CONDUCTOR AND ⅝", 7-STRAND, HIGH-STRENGTH STEEL OVERHEAD GROUNDWIRE.

SUM OF ADJACENT SPANS _____ 1900 FT
LDW POINT DISTANCE _____ 1300 FT
LINE ANGLE _____ 0°
NESC HEAVY, 1977 EDITION; ½" RADIAL ICE (57 LBS/FT³) 4 PSF WIND @ 0°F
TENSION: CONDUCTOR _____ 11,900 LBS
OGW _____ 7000 LBS
HIGH WIND; 80 MPH WIND @ 60°F W/1.23 HEIGHT FACTOR FOR WIRES AND 1.45 HEIGHT AND GUST FACTOR FOR STRUCTURES.
RIME ICE: 1½" RADIAL RIME (40 LBS/FT³), 4 PSF WIND @ 30°F



TYPICAL LOADING POINT LOCATION

GENERAL NOTES

CONTRACTOR SHALL DETERMINE EMBEDMENT "E" AND DIAMETER "D" BASED ON CRITERIA IN THE SPECIFICATIONS.
TYPICAL DETAILS OF CLIMBING PROVISIONS ARE SHOWN ON DWG NO. 43-28 2200.

REFERENCE DRAWINGS

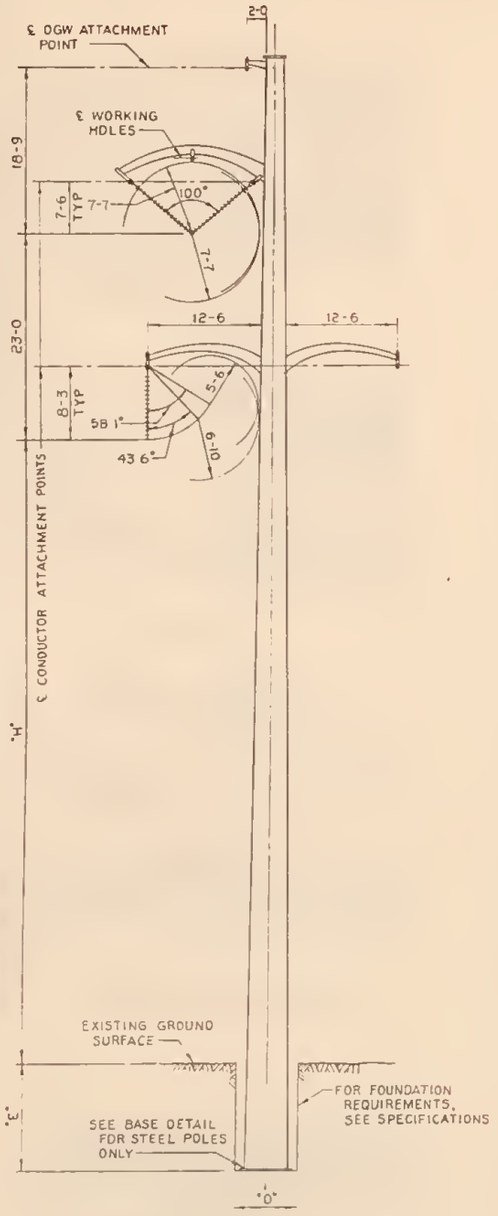
TYPE 28 POLES - CLIMBING PROVISIONS ___ 43-28 2200

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS — GOLDEN, COLORADO

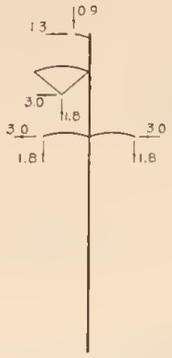
TRANSMISSION LINE STRUCTURES
28L POLES
OUTLINE AND DESIGN LOADS

DESIGNED R.A. ___ RECOMMENDED L.B. Hanes
DRAWN L.E. Marsh ___ APPROVED Ruth Eddy
CHECKED RAH ___ DIRECTOR, DIVISION OF CIVIL DESIGN

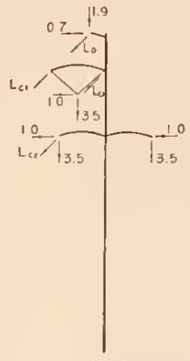
APRIL 23, 1984	43-28L	2200



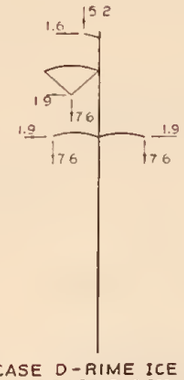
CASE A - NESC HEAVY
WIND ON POLE = 10 PSF
DEAD LOAD OF POLE x 1.5



CASE B - HIGH WIND
WIND ON POLE = 37 PSF
DEAD LOAD OF POLE x 1.1



CASE C - LONGITUDINAL UNBALANCE
WIND ON POLE = 5 PSF
DEAD LOAD OF POLE x 1.1
CASE C1: L_o=5.1, L_{c1}=0, L_{c2}=0
CASE C2: L_o=0, L_{c1}=4.0, L_{c2}=0
CASE C3 L_o=0, L_{c1}=0, L_{c2}=7.9



CASE D - RIME ICE
WIND ON POLE = 5 PSF
DEAD LOAD OF POLE x 1.1

DESIGN NOTES

ALL LOADS SHOWN ARE ULTIMATE VALUES AND INCLUDE OVERLOAD FACTORS
WIRE LOADS ARE IN KIPS AND ARE TOTAL FOR AHEAD AND BACK SPANS.
THE POLES AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF DEAD LOAD, WIND LOAD ON THE POLE, AND THE WIRE LOADS FOR EACH LOADING CASE
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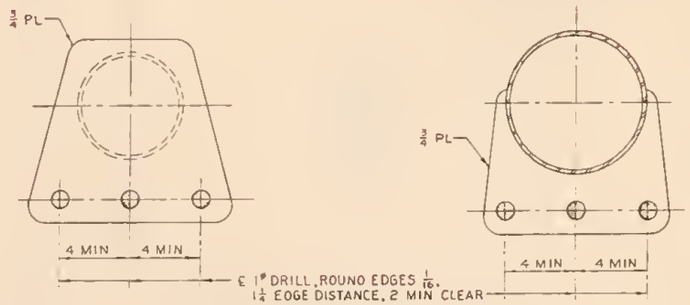
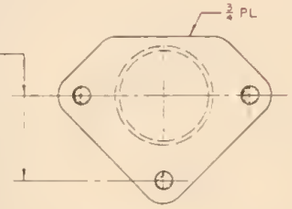
ELLIPTICAL = 1.2 (MAJOR AXIS)
= 0.91 (MINOR AXIS)
12-SIDED = 1.1
8-SIDED = 1.3
6-SIDED = 1.4
4-SIDED = 1.6

DESIGN LOADS ARE BASED ON 954 KCM ACSR 45/7 "RAIL" CONDUCTOR AND $\frac{3}{8}$" 7-STRAND, HIGH-STRENGTH STEEL OVERHEAD GROUNDWIRE.

SUM OF ADJACENT SPANS _____ 2150 TO 2000 FT
LOW POINT DISTANCE _____ 1500 FT
LINE ANGLE _____ 0 TO 1°
NESC HEAVY, 1977 EDITION; $\frac{1}{2}$ RADIAL ICE (57 LBS/FT^3)
4 PSF WIND @ 0°F
TENSION: CONDUCTOR _____ 11,900 LBS
OGW _____ 7000 LBS
HIGH WIND: 80 MPH WIND @ 60°F W/1.23 HEIGHT FACTOR FOR WIRES AND 1.45 HEIGHT AND GUST FACTOR FOR STRUCTURES
RIME ICE: 1$\frac{1}{2}$ RADIAL RIME (40 LBS/FT^3), 4 PSF WIND @ 30°F

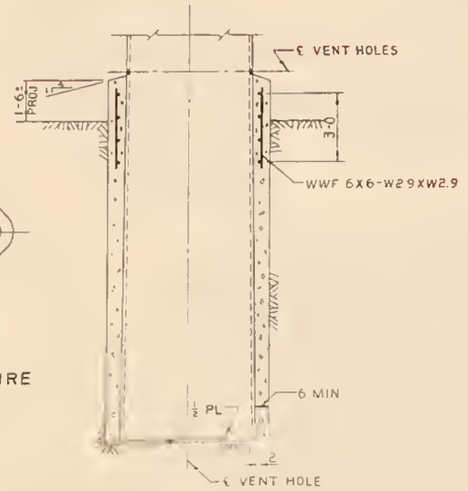


TYPICAL CONDUCTOR ATTACHMENTS AND WORKING HOLE ATTACHMENTS

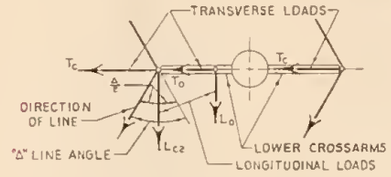


TYPICAL GROUNDWIRE ATTACHMENT

TYPE 28S POLES				
DESIGNATION	"H" (FT.)	"E" (FT.)	"D" (FT.)	WEIGHT (LBS)
28S-55	55-0			
28S-60	60-0			
28S-65	65-0			
28S-70	70-0			
28S-75	75-0			
28S-80	80-0			



BASE DETAIL FOR STEEL POLES ONLY



TYPICAL LOADING POINT LOCATION

GENERAL NOTES

CONTRACTOR SHALL DETERMINE EMBEDMENT "E" AND DIAMETER "D" BASED ON CRITERIA IN THE SPECIFICATIONS.
TYPICAL DETAILS OF CLIMBING PROVISIONS ARE SHOWN ON DWG NO. 43-28 2200.

REFERENCE DRAWINGS

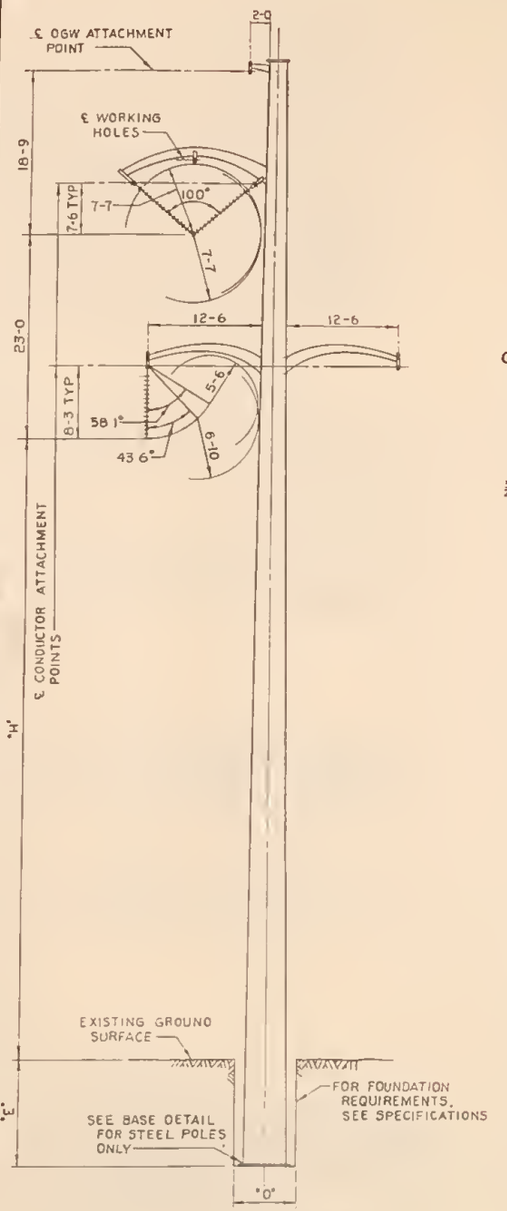
TYPE 28 POLES - CLIMBING PROVISIONS ___ 43-28 2200

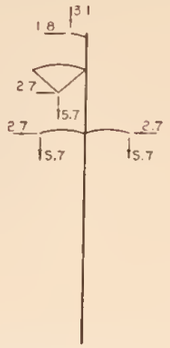
UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS — GOLDEN, COLORADO

TRANSMISSION LINE STRUCTURES
28S POLES
OUTLINE AND DESIGN LOADS

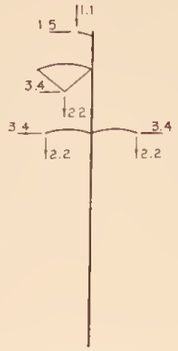
DESIGNED D.G. RECOMMENDED
DRAWN L.R. Mauldin APPROVED
CHECKED RMS DIRECTOR, DIVISION OF CIVIL DESIGN

APRIL 23, 1984	43-28S	2200

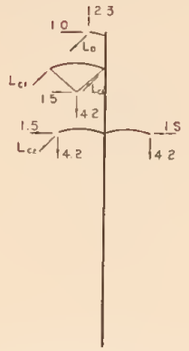




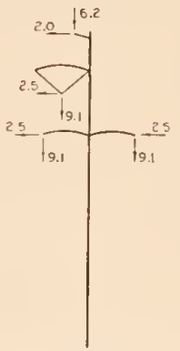
CASE A-NESC HEAVY
WIND ON POLE = 10 PSF
DEAD LOAD OF POLE x 1.5



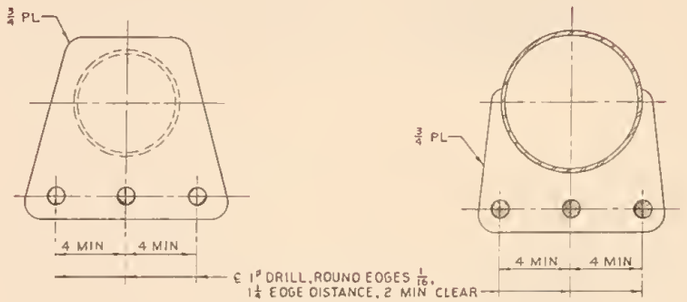
CASE B-HIGH WIND
WIND ON POLE = 37 PSF
DEAD LOAD OF POLE x 1.1



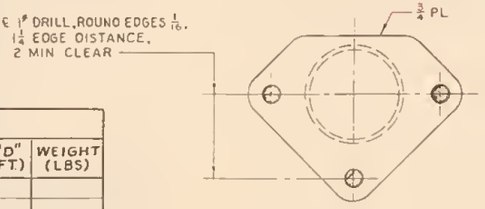
CASE C-LONGITUDINAL UNBALANCE
WIND ON POLE = 5 PSF
DEAD LOAD OF POLE x 1.1
CASE C1: L_o=5.1, L_{c1}=0, L_{c2}=0
CASE C2: L_o=0, L_{c1}=4.0, L_{c2}=0
CASE C3: L_o=0, L_{c1}=0, L_{c2}=7.9



CASE D-RIME ICE
WIND ON POLE = 5 PSF
DEAD LOAD OF POLE x 1.1

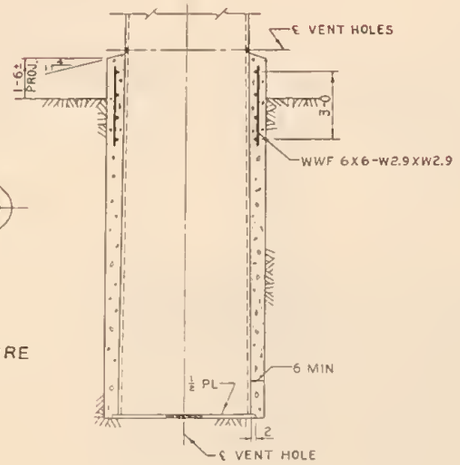


TYPICAL CONDUCTOR ATTACHMENTS AND WORKING HOLE ATTACHMENTS



TYPICAL GROUNOWIRE ATTACHMENT

TYPE 28X POLES				
DESIGNATION	"H" (FT)	"E" (FT)	"D" (FT)	WEIGHT (LBS)
28X-55	55-0			
28X-60	60-0			
28X-65	65-0			
28X-70	70-0			
28X-75	75-0			
28X-80	80-0			



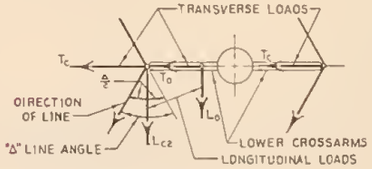
BASE DETAIL FOR STEEL POLES ONLY

DESIGN NOTES

ALL LOADS SHOWN ARE ULTIMATE VALUES AND INCLUDE OVERLOAD FACTORS
WIRE LOADS ARE IN KIPS AND ARE TOTAL FOR AHEAD AND BACK SPANS.
THE POLES AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF DEAD LOAD, WIND LOAD ON THE POLE, AND THE WIRE LOADS FOR EACH LOADING CASE.
THE STRUCTURE SHALL BE DESIGNED SELF-SUPPORTING; GUYS ARE NOT PERMITTED.
WIND PRESSURES SHOWN ON LOADING DIAGRAMS ARE BASED ON A SHAPE FACTOR OF 1.0 FOR CIRCULAR SECTIONS. FOR SECTIONS OTHER THAN CIRCULAR, MULTIPLY THE PRESSURES BY THE FOLLOWING SHAPE FACTORS:

ELLIPTICAL = 1.2 (MAJOR AXIS)
= 0.91 (MINOR AXIS)
12-SIDED = 1.1
8-SIDED = 1.3
6-SIDED = 1.4
4-SIDED = 1.6

DESIGN LOADS ARE BASED ON 954 KCM ACSR 45/7 "RAIL" CONDUCTOR AND ½" 7-STRAND, HIGH-STRENGTH STEEL OVERHEAD GROUNOWIRE.
SUM OF ADJACENT SPANS _____ 2400 TO 1600 FT
LOW POINT DISTANCE _____ 1800 FT
LINE ANGLE _____ 0 TO 4°
NESC HEAVY, 1977 EDITION; ½ RADIAL ICE (57 LBS/FT³) 4 PSF WIND @ 0°F
TENSION: CONDUCTOR _____ 11,900 LBS
OGW _____ 7000 LBS
HIGH WIND; 80 MPH WIND @ 60°F W/1.23 HEIGHT FACTOR FOR WIRES AND 1.45 HEIGHT AND GUST FACTOR FOR STRUCTURES
RIME ICE; 1½ RADIAL RIME (40 LBS/FT³), 4 PSF WIND @ 30°F



TYPICAL LOADING POINT LOCATION

GENERAL NOTES

CONTRACTOR SHALL DETERMINE EMBEDMENT "E" AND DIAMETER "D" BASED ON CRITERIA IN THE SPECIFICATIONS.
TYPICAL DETAILS OF CLIMBING PROVISIONS ARE SHOWN ON DWG NO 43-28 2200

REFERENCE DRAWINGS

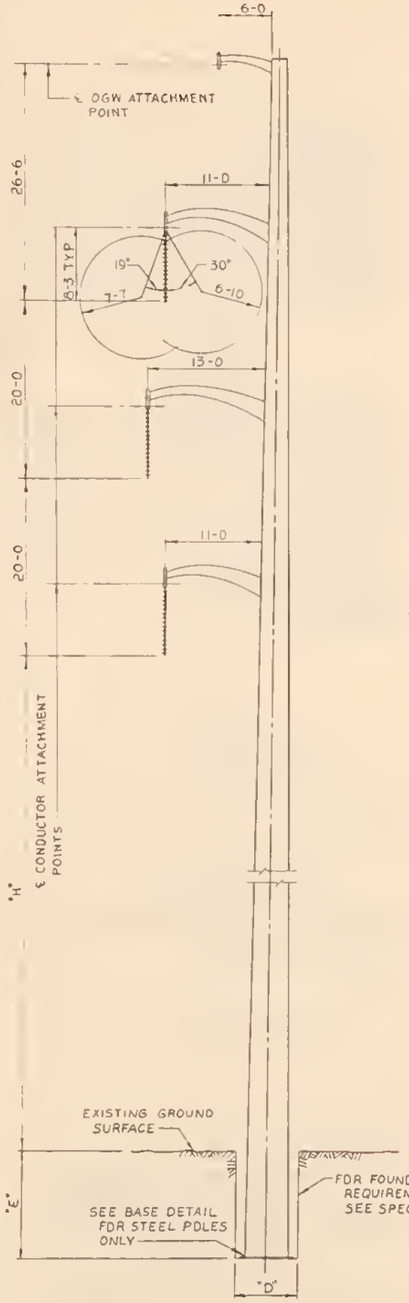
TYPE 28 POLES - CLIMBING PROVISIONS ___ 43-28 2200

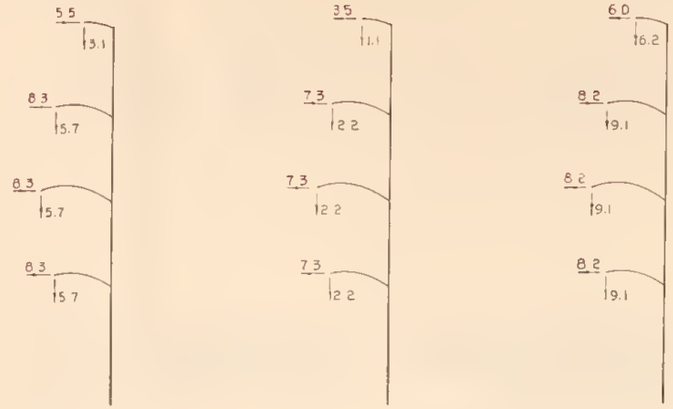
UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS — GOLDEN, COLORADO

TRANSMISSION LINE STRUCTURES
28X POLES
OUTLINE AND DESIGN LOADS

DESIGNED R.A. Scott — RECOMMENDED L.B. Hamm
DRAWN L.R. Mandt — APPROVED R. Wm. Roberts, DIRECTOR, DIVISION OF CIVIL DESIGN
CHECKED BSH JSH

APRIL 23, 1984	43-28X	2200





CASE A - NESC HEAVY

WIND ON POLE = 10 PSF
DEAD LOAD OF POLE X 1.5 OLF

CASE B - HIGH WIND

WIND ON POLE = 37 PSF
DEAD LOAD OF POLE X 1.1 OLF

CASE C - RIME ICE

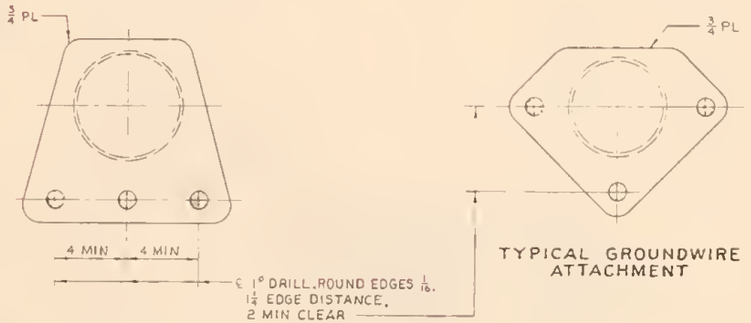
WIND ON POLE = 5 PSF
DEAD LOAD OF POLE X 1.1 OLF

CASE D - LONGITUDINAL UNBALANCE

WIND ON POLE = 5 PSF
DEAD LOAD OF POLE X 1.1 OLF
CASE D1: L_o = 5 D , L_c = D
CASE D2: L_o = D , L_c = 7.8

CASE E - HIGH WIND

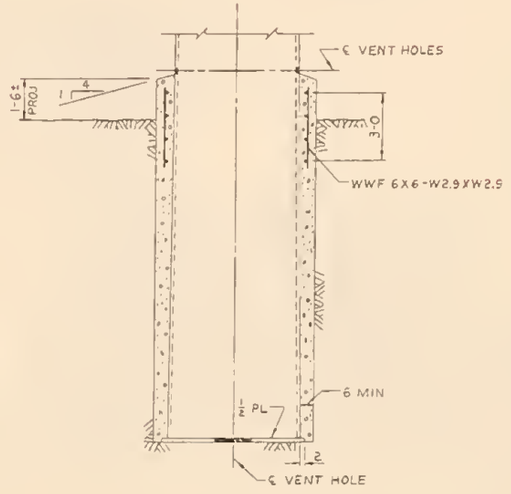
WIND ON POLE = 37 PSF
DEAD LOAD OF POLE X 1.1 OLF



TYPICAL CONDUCTOR ATTACHMENT

TYPICAL GROUNDWIRE ATTACHMENT

TYPE 28A POLES				
DESIGNATION	"H" (FT)	"E" (FT)	"D" (FT)	WEIGHT (LBS)
28A-60	60-0			
28A-65	65-0			
28A-70	70-0			
28A-75	75-0			



BASE DETAIL FOR STEEL POLES ONLY

DESIGN NOTES

ALL LOADS ARE ULTIMATE VALUES AND INCLUDE OVERLOAD FACTORS.
WIRE LOADS ARE IN KIPS AND ARE TOTAL FOR AHEAD AND BACK SPANS.
THE POLES AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF DEAD LOAD, WIND ON THE POLE, AND THE WIRE LOADS FOR EACH LOADING CASE.
THE CONTRACTOR SHALL DETERMINE THE NUMBER, SIZE AND LOCATION OF ALL GUYS AND ANCHORS.
GUYING ARRANGEMENTS SHALL BE PROVIDED FOR LINE ANGLES RANGING FROM 4° TO 20°
ALL GUYS SHALL BE LOCATED TO PROVIDE A MINIMUM 78-INCH ELECTRICAL CLEARANCE FROM ANY CONDUCTOR.
WIND PRESSURES SHOWN ON LOADING DIAGRAMS ARE BASED ON A SHAPE FACTOR OF 1.0 FOR CIRCULAR SECTIONS. FOR SECTIONS OTHER THAN CIRCULAR, MULTIPLY THE PRESSURES BY THE FOLLOWING SHAPE FACTORS:

ELLIPTICAL = 1.2 (MAJOR AXIS)
0.91 (MINOR AXIS)
12-SIDED = 1.1
8-SIDED = 1.3
6-SIDED = 1.4
4-SIDED = 1.6

DESIGN LOADS ARE BASED ON 954 KCM ACSR 45/7 "RAIL" CONDUCTOR AND ⅜", 7-STRAND, HIGH-STRENGTH STEEL OVERHEAD GROUND WIRE.
SUM OF ADJACENT SPANS _ _ _ _ _ _ _ 2400 FT
LOW POINT DISTANCE _ _ _ _ _ _ _ _ _ 1800 FT
LINE ANGLE _ _ _ _ _ _ _ _ _ _ _ _ 4° TO 20°
NESC HEAVY, 1977 EDITION, ½" RADIAL ICE (57 LBS/FT³), 4 PSF WIND @ 0°F.
TENSION: CONDUCTOR _ _ _ _ _ _ 11,900 LBS
OGW _ _ _ _ _ _ _ _ 7000 LBS
HIGH WIND: 80 MPH WIND @ 60°F W/1.25 GUST FACTOR FOR WIRES AND 1.45 HEIGHT AND GUST FACTOR FOR STRUCTURES
RIME ICE: 1½" RADIAL RIME (40 LBS/FT³), 4 PSF WIND @ 30°F.

GENERAL NOTES

CONTRACTOR SHALL DETERMINE EMBEDMENT "E" AND DIAMETER "D" BASED ON CRITERIA INCLUDED IN THE SPECIFICATIONS.
TYPICAL DETAILS OF CLIMBING PROVISIONS ARE SHOWN ON DWG NO. 43-28 2200.
GUYING RESTRICTIONS AND RIGHT-OF-WAY LIMITATIONS ARE SHOWN ON DWG NO. 43-28 2050

REFERENCE DRAWINGS

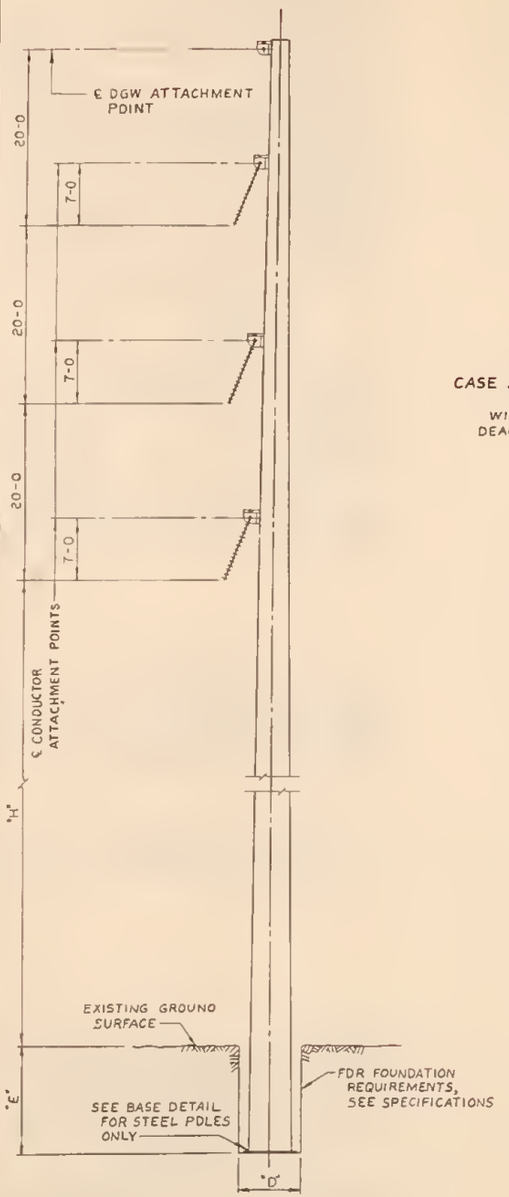
TYPE 28 POLES - CLIMBING PROVISIONS _ _43-28 2200
TYPE 28 POLES - GUYING RESTRICTIONS _ _43-28 2050

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS — GOLDEN, COLORADO

TRANSMISSION LINE STRUCTURES
28A POLES
OUTLINE AND DESIGN LOADS

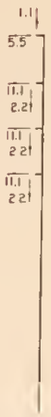
DESIGNED R.C. Sato — RECOMMENDED L.B. Hom
DRAWN G. Mills — APPROVED Russ Strand
CHECKED B.M. — J.S.H. — DIRECTOR, DIVISION OF CIVIL DESIGN

APRIL 23, 1984	43-28A	2200



CASE A - NESC HEAVY

WIND ON POLE = 10 PSF
DEAD LOAD OF POLE X 1.5 OLF

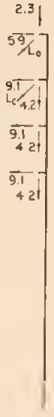


CASE B - HIGH WIND

WIND ON POLE = 37 PSF
DEAD LOAD OF POLE X 1.1 OLF

CASE C-RIME ICE

WIND ON POLE=5 PSF
DEAD LOAD OF POLE X 1.1 OLF



CASE D-LONGITUDINAL UNBALANCE

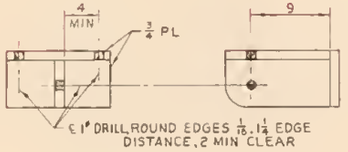
WIND ON POLE=5 PSF
DEAD LOAD OF POLE X 1.1 OLF
CASE D1 $L_o = 4.8, L_c = 0$
CASE D2: $L_o = 0, L_c = 7.5$

DESIGN NOTES

ALL LOADS ARE ULTIMATE VALUES AND INCLUDE OVERLOAD FACTORS.
WIRE LOADS ARE IN KIPS AND ARE TOTAL FOR AHEAD AND BACK SPANS.
THE POLES AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF DEAD LOAD, WIND ON THE POLE, AND THE WIRE LOADS FOR EACH LOADING CASE.
THE CONTRACTOR SHALL DETERMINE THE NUMBER, SIZE AND LOCATION OF ALL GUYS AND ANCHORS.
GUYING ARRANGEMENTS SHALL BE PROVIDED FOR LINE ANGLES RANGING FROM 20 TO 40°
ALL GUYS SHALL BE LOCATED TO PROVIDE A MINIMUM 78-INCH ELECTRICAL CLEARANCE FROM ANY CONDUCTOR.
WIND PRESSURES SHOWN ON LOADING DIAGRAMS ARE BASED ON A SHAPE FACTOR OF 1.0 FOR CIRCULAR SECTIONS. FOR SECTIONS OTHER THAN CIRCULAR, MULTIPLY THE PRESSURES BY THE FOLLOWING SHAPE FACTORS:

ELLIPTICAL = 1.2 (MAJOR AXIS)
0.91 (MINOR AXIS)
12-SIDED = 1.1
8-SIDED = 1.3
6-SIDED = 1.4
4-SIDED = 1.6

DESIGN LOADS ARE BASED ON 954 KCM ACSR 45/7 "RAIL" CONDUCTOR AND $\frac{1}{2}\phi$, 7-STRAND, HIGH-STRENGTH STEEL OVERHEAD GROUND WIRE.
SUM OF ADJACENT SPANS _____ 2400 FT
LOW POINT DISTANCE _____ 1800 FT
LINE ANGLE _____ 20 TO 40°
NESC HEAVY, 1977 EDITION, $\frac{1}{2}$ RADIAL ICE (57 LBS/FT^3), 4 PSF WIND @ 0°F.
TENSION: CONDUCTOR _____ 11,900 LBS
OGW _____ 7000 LBS
HIGH WIND: 80 MPH WIND @ 60°F W/1.23 GUST FACTOR FOR WIRES AND L45 HEIGHT AND GUST FACTOR FOR STRUCTURES
RIME ICE: $1\frac{1}{2}$ RADIAL RIME (40 LBS/FT^3), 4 PSF WIND @ 30° F.



TYPICAL ATTACHMENTS

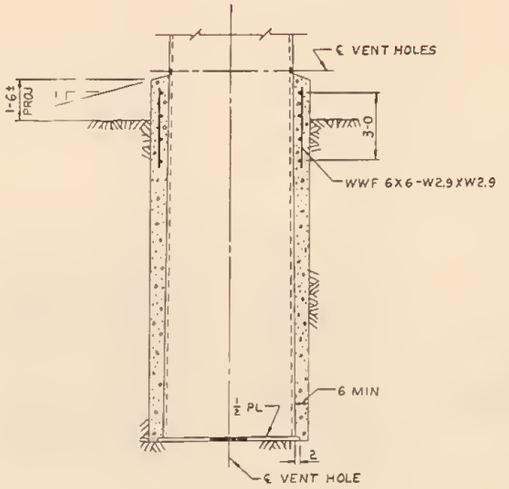
GENERAL NOTES

CONTRACTOR SHALL DETERMINE EMBEDMENT "E" AND DIAMETER "D" BASED ON CRITERIA INCLUDED IN THE SPECIFICATIONS.
TYPICAL DETAILS OF CLIMBING PROVISIONS ARE SHOWN ON DWG NO. 43-28 2200.
GUYING RESTRICTIONS AND RIGHT-OF-WAY LIMITATIONS ARE SHOWN ON DWG NO. 43-28 2050

REFERENCE DRAWINGS

TYPE 28 POLES - CLIMBING PROVISIONS ___ 43-28 2200
TYPE 28 POLES - GUYING RESTRICTIONS ___ 43-28 2050

TYPE 28B POLES				
DESIGNATION	"H" (FT)	"E" (FT)	"D" (FT)	WEIGHT (LBS)
28B-60	60-0			
28B-65	65-0			
28B-70	70-0			
28B-75	75-0			
28B-80	80-0			



BASE DETAIL FOR STEEL POLES ONLY

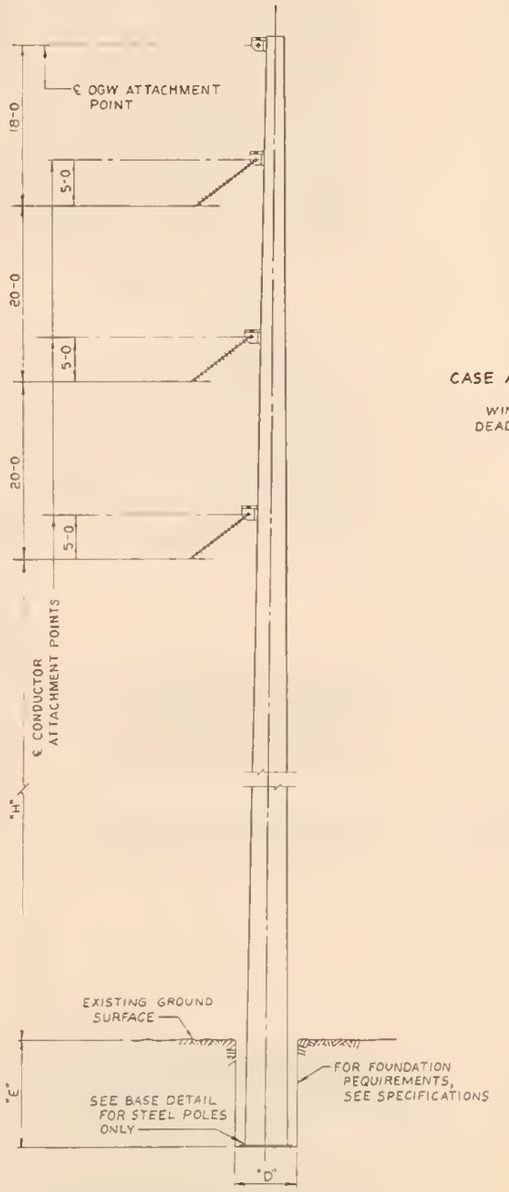
UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS — GOLDEN, COLORADO

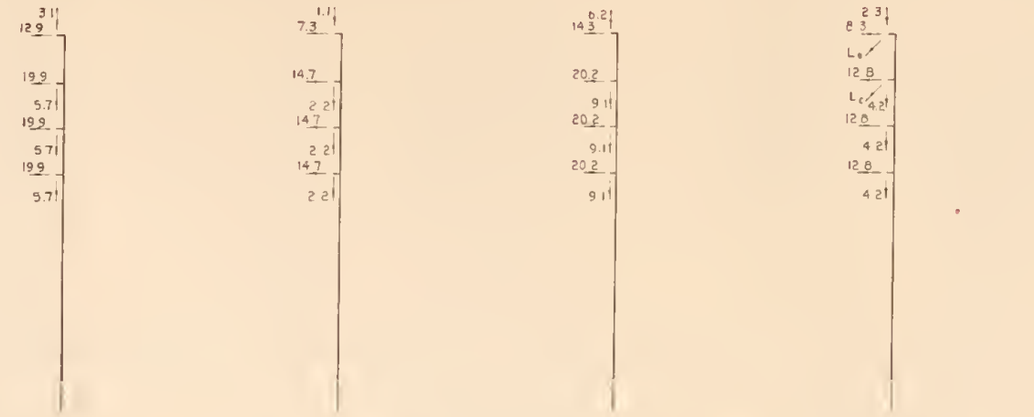
TRANSMISSION LINE STRUCTURES
28B POLES
OUTLINE AND DESIGN LOADS

DESIGNED R.D. Scott — RECOMMENDED A.B. Hoover
DRAWN G. Mirelo — APPROVED
CHECKED DLR ABH — DIRECTOR, DIVISION OF CIVIL DESIGN

APRIL 23, 1984 | 43-288 | 2200

9





CASE A - NESC HEAVY

WIND ON POLE = 10 PSF
DEAD LOAD OF POLE X 1.5 OLF

CASE B - HIGH WIND

WIND ON POLE = 37 PSF
DEAD LOAD OF POLE X 1.1 OLF

CASE C-RIME ICE

WIND ON POLE = 5 PSF
DEAD LOAD OF POLE X 1.1 OLF

CASE D-LONGITUDINAL UNBALANCE

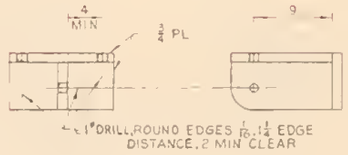
WIND ON POLE = 5 PSF
DEAD LOAD OF POLE X 1.1 OLF
CASE D1: $L_0 = 4.4$, $L_c = 0$
CASE D2: $L_0 = 0$, $L_c = 6.9$

DESIGN NOTES

ALL LOADS ARE ULTIMATE VALUES AND INCLUDE OVERLOAD FACTORS.
WIRE LOADS ARE IN KIPS AND ARE TOTAL FOR AHEAD AND BACK SPANS.
THE POLES AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF DEAD LOAD, WIND ON THE POLE, AND THE WIRE LOADS FOR EACH LOADING CASE.
THE CONTRACTOR SHALL DETERMINE THE NUMBER, SIZE AND LOCATION OF ALL GUYS AND ANCHORS.
GUYING ARRANGEMENTS SHALL BE PROVIDED FOR LINE ANGLES RANGING FROM 40 TO 60°
ALL GUYS SHALL BE LOCATED TO PROVIDE A MINIMUM 78-INCH ELECTRICAL CLEARANCE FROM ANY CONDUCTOR.
WIND PRESSURES SHOWN ON LOADING DIAGRAMS ARE BASED ON A SHAPE FACTOR OF 1.0 FOR CIRCULAR SECTIONS. FOR SECTIONS OTHER THAN CIRCULAR, MULTIPLY THE PRESSURES BY THE FOLLOWING SHAPE FACTORS:

ELLIPTICAL = 1.2 (MAJOR AXIS)
0.91 (MINOR AXIS)
12-SIDED = 1.1
8-SIDED = 1.3
6-SIDED = 1.4
4-SIDED = 1.6

DESIGN LOADS ARE BASED ON 954 KCM ACSR 45/7 "RAIL" CONDUCTOR AND $\frac{1}{2}$", 7-STRAND, HIGH-STRENGTH STEEL OVERHEAD GROUND WIRE.
SUM OF ADJACENT SPANS _ _ _ _ _ _ _ 2400 FT
LOW POINT DISTANCE _ _ _ _ _ _ _ _ 1800 FT
LINE ANGLE _ _ _ _ _ _ _ _ _ _ 40 TO 60°.
NESC HEAVY, 1977 EDITION, $\frac{1}{2}$ RADIAL ICE (57 LBS/FT^3), 4 PSF WIND @ 0°F.
TENSION: CONDUCTOR _ _ _ _ _ _ 11,900 LBS
OGW _ _ _ _ _ _ _ _ 7000 LBS
HIGH WIND: 80 MPH WIND @ 60°F W/1.23 GUST FACTOR FOR WIRES AND 1.45 HEIGHT AND GUST FACTOR FOR STRUCTUR
RIME ICE: $1\frac{1}{2}$ RADIAL RIME (40 LBS/FT^3), 4 PSF WIND @ 30° F.



TYPICAL ATTACHMENTS

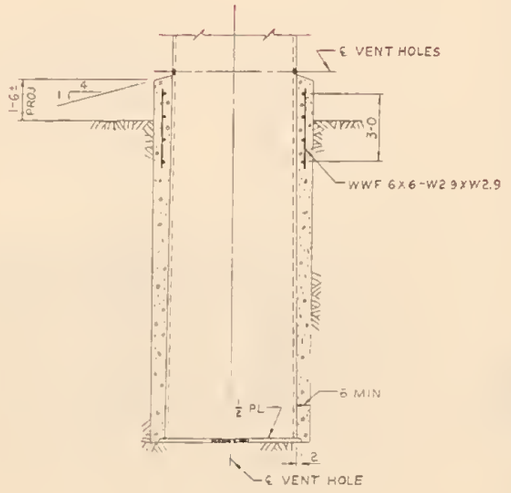
GENERAL NOTES

CONTRACTOR SHALL DETERMINE EMBEDMENT "E" AND DIAMETER "D" BASED ON CRITERIA INCLUDED IN THE SPECIFICATIONS.
TYPICAL DETAILS OF CLIMBING PROVISIONS ARE SHOWN ON DWG NO. 43-28 2200.
GUYING RESTRICTIONS AND RIGHT-OF-WAY LIMITATIONS ARE SHOWN ON DWG NO 43-28 2050

REFERENCE DRAWINGS

TYPE 28 POLES - CLIMBING PROVISIONS _ _ 43-28 2200
TYPE 28 POLES - GUYING RESTRICTIONS _ _ _ 43-28 2050

TYPE 28C POLES				
DESIGNATION	"H" (FT)	"E" (FT)	"D" (FT)	WEIGHT (LBS)
28C-60	60-0			
28C-65	65-0			
28C-70	70-0			
28C-75	75-0			



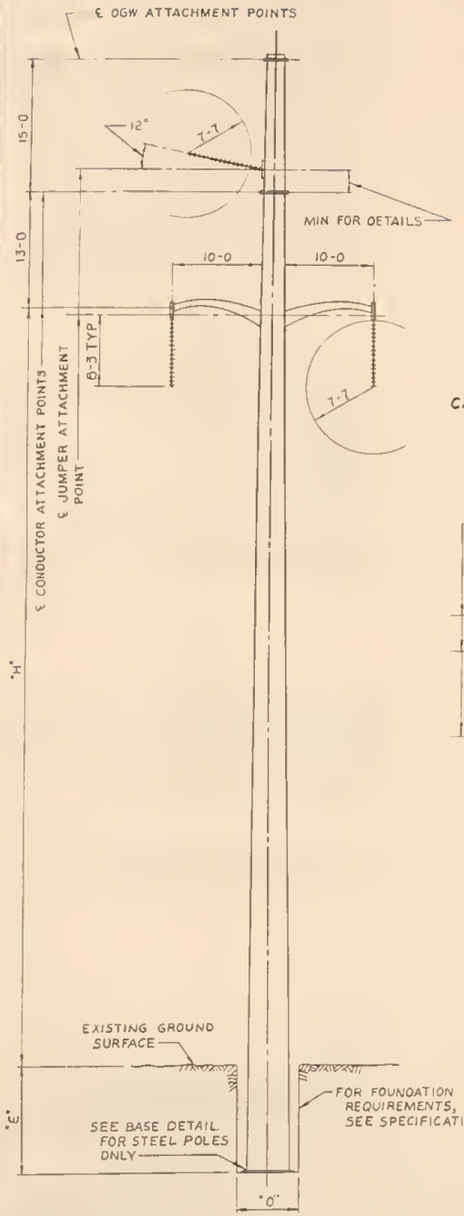
BASE DETAIL FOR STEEL POLES ONLY

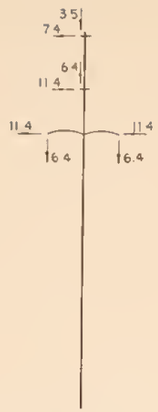
UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS — GOLDEN, COLORADO

TRANSMISSION LINE STRUCTURES
28C POLES
OUTLINE AND DESIGN LOADS

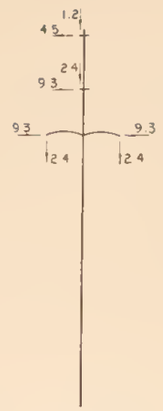
DESIGNED D.A. Lotts — RECOMMENDED R. E. Hanson
DRAWN G. Morales — APPROVED
CHECKED E.K.R. — DIRECTOR, DIVISION OF CIVIL DESIGN

APRIL 23, 1984	43-28C	2200

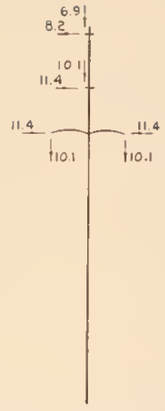




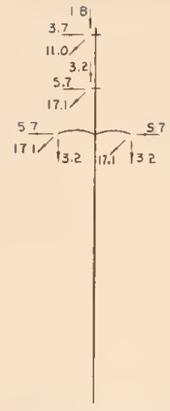
CASE A3I - NESC HEAVY
30° LINE ANGLE, INTACT
WIND ON POLE = 10 PSF
DEAD LOAD OF POLE X 1.5 OLF



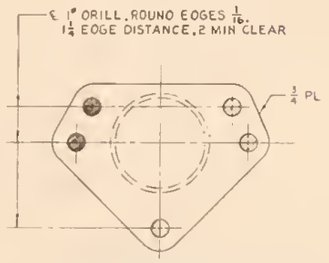
CASE B - HIGH WIND
30° LINE ANGLE, INTACT
WIND ON POLE = 37 PSF
DEAD LOAD OF POLE X 1.1 OLF



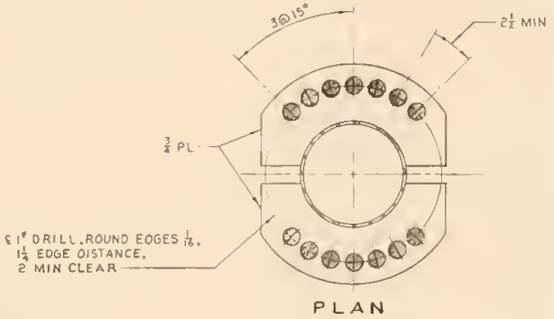
CASE C - RIME ICE
30° LINE ANGLE, INTACT
WIND ON POLE = 5 PSF
DEAD LOAD OF POLE X 1.1 OLF



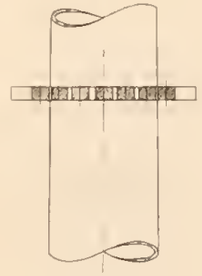
CASE A3D - NESC HEAVY
30° LINE ANGLE, FULL DEAD END
WIND ON POLE = 10 PSF
DEAD LOAD OF POLE X 1.5 OLF



LOWER CONDUCTOR ATTACHMENT



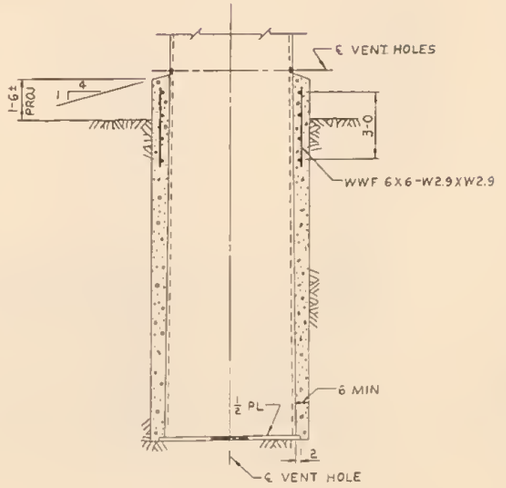
PLAN



ELEVATION

OGW AND UPPER CONDUCTOR ATTACHMENTS

TYPE 28D POLES				
DESIGNATION	"H" (FT)	"E" (FT)	"D" (FT)	WEIGHT (LBS)
280-55	55-0			
280-60	60-0			
280-65	65-0			
280-70	70-0			



BASE DETAIL FOR STEEL POLES ONLY

DESIGN NOTES

ALL LOADS ARE ULTIMATE VALUES AND INCLUDE OVERLOAD FACTORS.
WIRE LOADS ARE IN KIPS AND ARE TOTAL FOR AHEAD AND BACK SPANS.
THE POLES AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF DEAD LOAD, WIND ON THE POLE, AND THE WIRE LOADS FOR EACH LOADING CASE.
THE CONTRACTOR SHALL DETERMINE THE NUMBER, SIZE AND LOCATION OF ALL GUYS AND ANCHORS.
GUYING ARRANGEMENTS SHALL BE PROVIDED FOR LINE ANGLES RANGING FROM 0 TO 30°
ALL GUYS SHALL BE LOCATED TO PROVIDE A MINIMUM 78-INCH ELECTRICAL CLEARANCE FROM ANY CONDUCTOR.
WIND PRESSURES SHOWN ON LOADING DIAGRAMS ARE BASED ON A SHAPE FACTOR OF 1.0 FOR CIRCULAR SECTIONS. FOR SECTIONS OTHER THAN CIRCULAR, MULTIPLY THE PRESSURES BY THE FOLLOWING SHAPE FACTORS:
ELLIPTICAL = 1.2 (MAJOR AXIS)
0.91 (MINOR AXIS)
12-SIDED = 1.1
8-SIDED = 1.3
6-SIDED = 1.4
4-SIDED = 1.6
DESIGN LOADS ARE BASED ON 954 KCM ACSR 45/7 "RAIL" CONDUCTOR AND 3/8", 7-STRAND, HIGH-STRENGTH STEEL OVERHEAD GROUND WIRE.
SUM OF ADJACENT SPANS _____ 2400 FT
LOW POINT DISTANCE _____ 2000 FT
LINE ANGLE _____ 0 TO 30°
NESC HEAVY, 1977 EDITION, 1/2 RADIAL ICE (57 LBS/FT³), 4 PSF WIND @ 0°F.
TENSION: CONDUCTOR _____ 11,900 LBS
OGW _____ 7000 LBS
HIGH WIND: 80 MPH WIND @ 60°F W/1.23 GUST FACTOR FOR WIRES AND 1.45 HEIGHT AND GUST FACTOR FOR STRUCTURES
RIME ICE: 1 1/2 RADIAL RIME (40 LBS/FT³), 4 PSF WIND @ 30°F.

GENERAL NOTES

CONTRACTOR SHALL DETERMINE EMBEDMENT "E" AND DIAMETER "D" BASED ON CRITERIA INCLUDED IN THE SPECIFICATIONS.
TYPICAL DETAILS OF CLIMBING PROVISIONS ARE SHOWN ON DWG NO. 43-28 2200.
GUYING RESTRICTIONS AND RIGHT-OF-WAY LIMITATIONS ARE SHOWN ON DWG NO. 43-28 2050

REFERENCE DRAWINGS

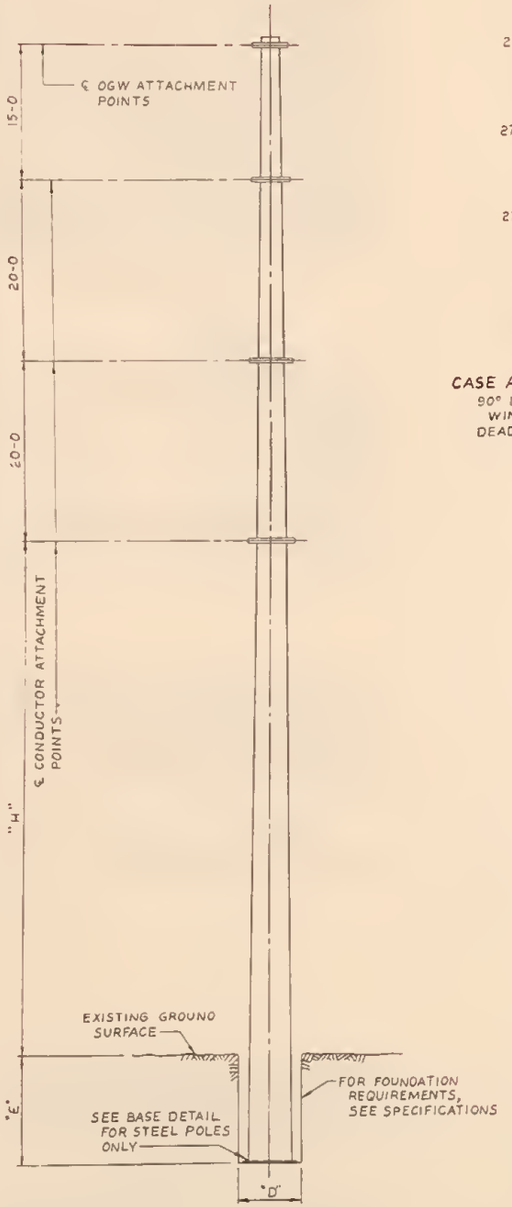
TYPE 28 POLES - CLIMBING PROVISIONS _____ 43-28 2200
TYPE 28 POLES - GUYING RESTRICTIONS _____ 43-28 2050

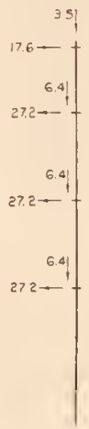
UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS — GOLDEN, COLORADO

TRANSMISSION LINE STRUCTURES
28D POLES
OUTLINE AND DESIGN LOADS

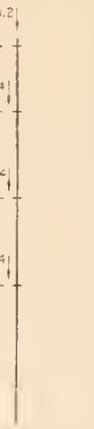
DESIGNED L. D. Jones _____ RECOMMENDED L. B. Hanson
DRAWN L. Manke _____ APPROVED Elmer Schulte
CHECKED BLG _____ DIRECTOR, DIVISION OF CIVIL DESIGN

APRIL 23, 1984	43-28D	2200

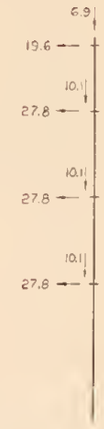




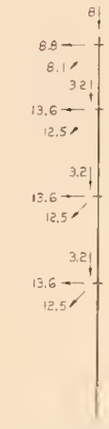
CASE A9I - NESC HEAVY
90° LINE ANGLE - INTACT
WIND ON POLE = 10 PSF
DEAD LOAD OF POLE X 1.5 OLF



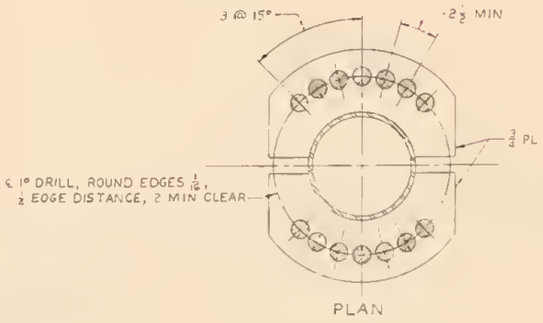
CASE B - HIGH WIND
90° LINE ANGLE - INTACT
WIND ON POLE = 37 PSF
DEAD LOAD OF POLE X 1.1 OLF



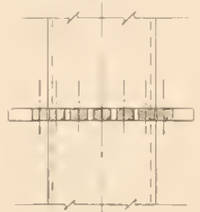
CASE C - RIME ICE
90° LINE ANGLE - INTACT
WIND ON POLE = 5 PSF
DEAD LOAD OF POLE X 1.1 OLF



CASE A9D - NESC HEAVY
90° LINE ANGLE - FULL DEAD END
WIND ON POLE = PSF
DEAD LOAD OF POLE X OLF



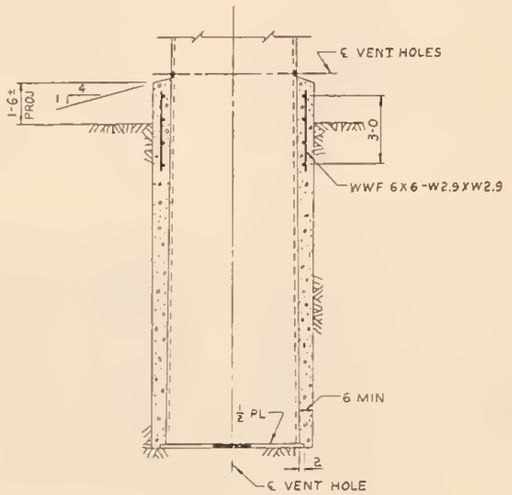
PLAN



ELEVATION

TYPICAL ATTACHMENTS

TYPE 28N POLES				
DESIGNATION	"H" (FT)	"E" (FT)	"D" (FT)	WEIGHT (LBS)
28N-55	55-0			
28N-60	60-0			
28N-65	65-0			
28N-70	70-0			
28N-75	75-0			
28N-80	80-0			



BASE DETAIL FOR STEEL POLES ONLY

DESIGN NOTES

ALL LOADS ARE ULTIMATE VALUES AND INCLUDE OVERLOAD FACTORS.
WIRE LOADS ARE IN KIPS AND ARE TOTAL FOR AHEAD AND BACK SPANS.
THE POLES AND ATTACHMENTS SHALL BE DESIGNED FOR THE SIMULTANEOUS APPLICATION OF DEAD LOAD, WIND ON THE POLE, AND THE WIRE LOADS FOR EACH LOADING CASE.
THE CONTRACTOR SHALL DETERMINE THE NUMBER, SIZE AND LOCATION OF ALL GUYS AND ANCHORS.
GUYING ARRANGEMENTS SHALL BE PROVIDED FOR LINE ANGLES RANGING FROM 60 TO 90°.
ALL GUYS SHALL BE LOCATED TO PROVIDE A MINIMUM 78-INCH ELECTRICAL CLEARANCE FROM ANY CONDUCTOR.
WIND PRESSURES SHOWN ON LOADING DIAGRAMS ARE BASED ON A SHAPE FACTOR OF 1.0 FOR CIRCULAR SECTIONS. FOR SECTIONS OTHER THAN CIRCULAR, MULTIPLY THE PRESSURES BY THE FOLLOWING SHAPE FACTORS:
ELLIPTICAL = 1.2 (MAJOR AXIS)
0.91 (MINOR AXIS)
12-SIDED = 1.1
8-SIDED = 1.3
6-SIDED = 1.4
4-SIDED = 1.6
DESIGN LOADS ARE BASED ON 954 KCM ACSR 45/7 "RAIL" CONDUCTOR AND $\frac{1}{2}$", 7-STRAND, HIGH-STRENGTH STEEL OVERHEAD GROUND WIRE.
SUM OF ADJACENT SPANS _____ 2400 FT
LOW POINT DISTANCE _____ 2000 FT
LINE ANGLE _____ 60 TO 90°
NESC HEAVY, 1977 EDITION, $\frac{1}{2}$ RADIAL ICE (57 LBS/FT^3), 4 PSF WIND @ 0°F.
TENSION: CONDUCTOR _____ 11,900 LBS
OGW _____ 7000 LBS
HIGH WIND: 80 MPH WIND @ 60°F W/1.23 GUST FACTOR FOR WIRES AND 1.45 HEIGHT AND GUST FACTOR FOR STRUCTURE
RIME ICE: 1$\frac{1}{2}$ RADIAL RIME (40 LBS/FT^3), 4 PSF WIND @ 30°F.

GENERAL NOTES

CONTRACTOR SHALL DETERMINE EMBEDMENT "E" AND DIAMETER "D" BASED ON CRITERIA INCLUDED IN THE SPECIFICATIONS.
TYPICAL DETAILS OF CLIMBING PROVISIONS ARE SHOWN ON DWG NO. 43-28 2200.
GUYING RESTRICTIONS AND RIGHT-OF-WAY LIMITATIONS ARE SHOWN ON DWG NO. 43-28 2050.

REFERENCE DRAWINGS

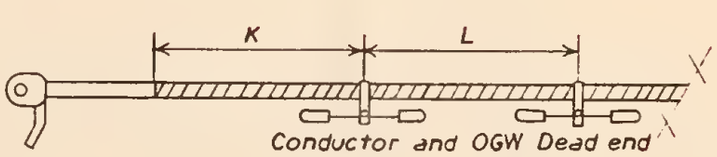
TYPE 28 POLES - CLIMBING PROVISIONS _____ 43-28 2200
TYPE 28 POLES - GUYING RESTRICTIONS _____ 43-28 2050

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS — GOLDEN, COLORADO

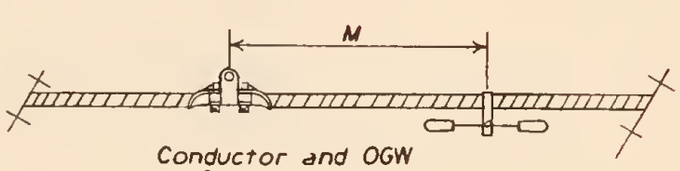
TRANSMISSION LINE STRUCTURES
28N POLES
OUTLINE AND DESIGN LOADS

DESIGNED R. A. Sutton — RECOMMENDED J. E. Hanson
DRAWN R. A. Sutton — APPROVED DIRECTOR, DIVISION OF CIVIL DESIGN
CHECKED [illegible]

APRIL 23, 1984	43-28N	2200



Conductor and OGW Dead end
At Both Ends Of Span



Conductor and OGW
In Suspension

Cond. or OGW Size	Initial Tmax NESC Heavy	60°F Final Tension lbs	0°F Final Tension lbs	Span Length ft	Number of Dampers	K	L	M	Damper Assembly Weight
954 Kcm 45/7 ACSR	11260	4550	5970	600 TO 1200					
1/2 in HS OGW	6970	2790	3130	600 TO 1200					

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS – GOLDEN, COLORADO

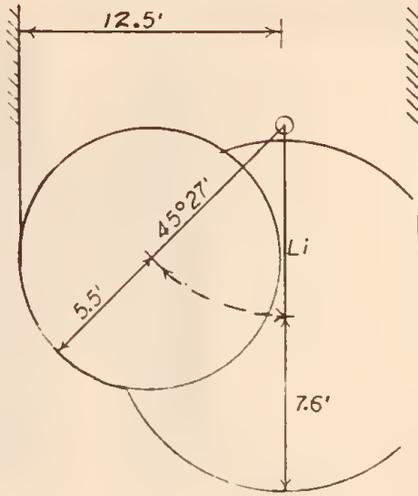
GREAT FALLS-CONRAD
230 KV TRANSMISSION LINE
MONTANA

VIBRATION DAMPERS

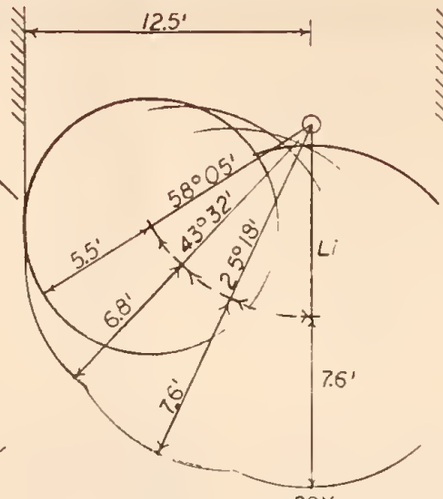
DESIGNED [illegible] RECOMMENDED
DRAWN R. [illegible] APPROVED
CHECKED Neil Kaup CHIEF, POWER BRANCH

APRIL 27, 1984 | GTF-CON | 1004

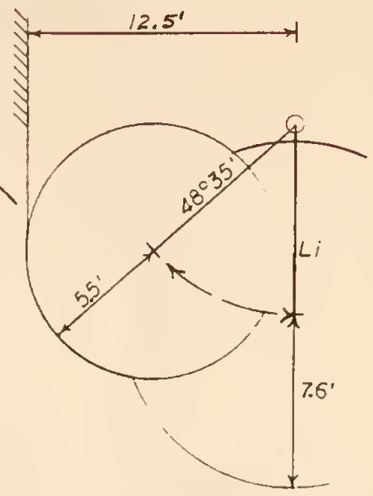
13



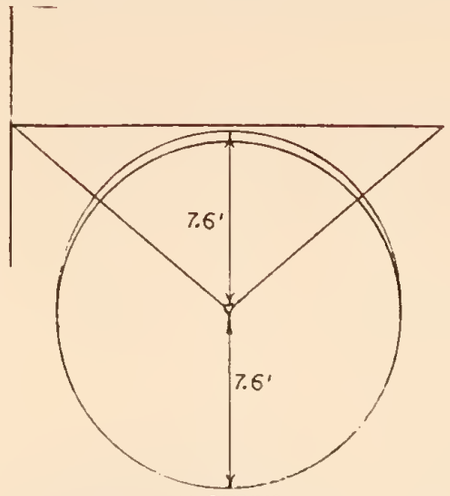
28L



28X

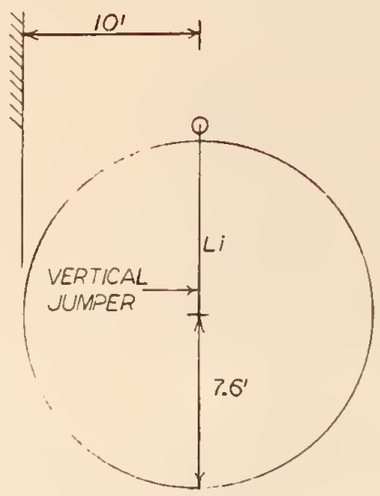


28S

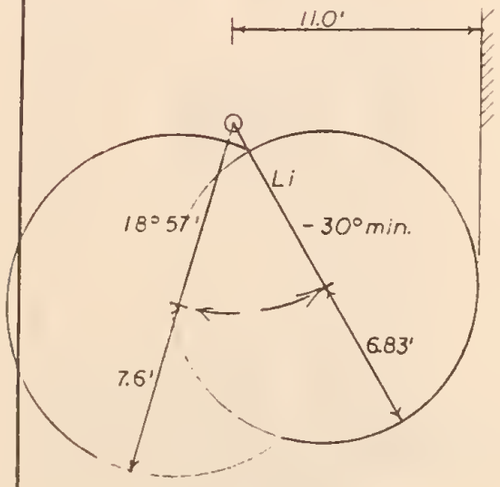


V-STRING

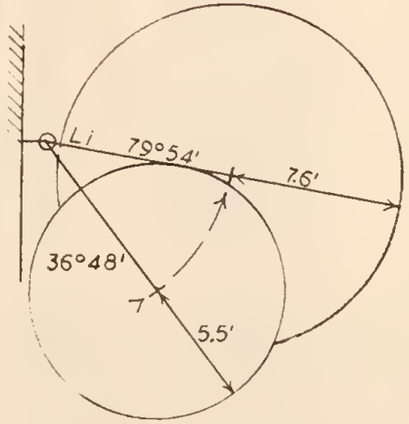
NOTE: Electrical clearance for the V-String assembly shall be measured from any point of the yolk plate and from the bottom of the suspension clamp.



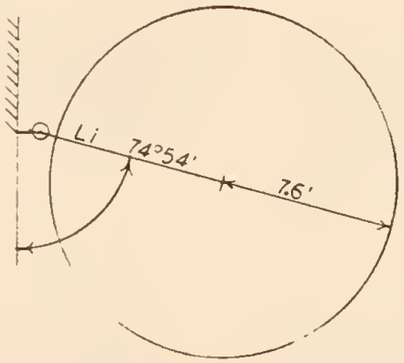
28D



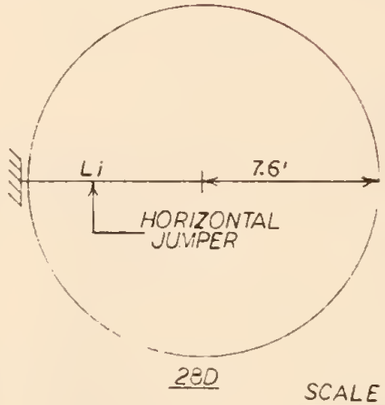
28A



28B



28C



28D

NOTES
1. Li indicates insulator length
2 Electrical clearance shall be maintained to any structure surface.
3. O indicates insulator attachment point.

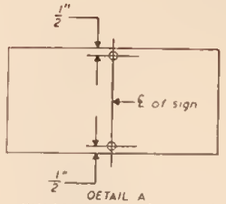
SCALE: NONE

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS - GOLDEN, COLORADO

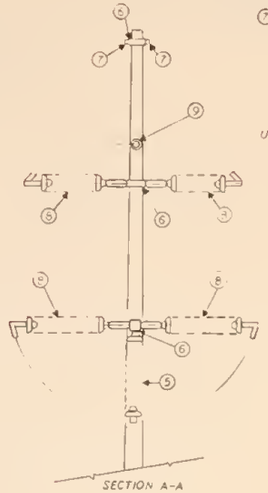
GREAT FALLS–CONRAD
230 KV TRANSMISSION LINE
MONTANA
CLEARANCE PATTERNS

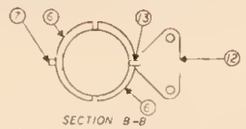
DESIGNED V. L. Hall RECOMMENDED
DRAWN APPROVED
CHECKED Chief, Power Branch

APRIL 27, 1984 GTF-CON 1003



DETAIL A
Hole Locations for Structure Signs



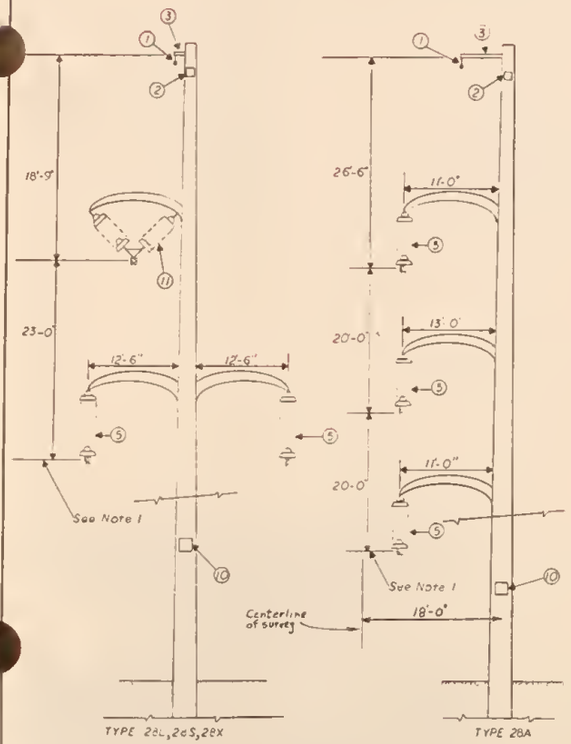


SECTION B-B
Use Yoke Plate on Substation Approach Spans

ITEM	DESCRIPTION
1	OGW Suspension Assembly
2	Aerial Patrol Sign
3	OGW ATTACHMENT EXTENSION
4	Hot Line Fitting
5	Suspension Insulator Assembly
6	Conductor or OGW Attachment
7	OGW Tension Assembly
8	Tension Insulator Assembly
9	Insulator Line Post
10	Structure Number Sign
11	V-String INSULATOR ASSEMBLY
12	Yoke Plate
13	VEE SHACKLE

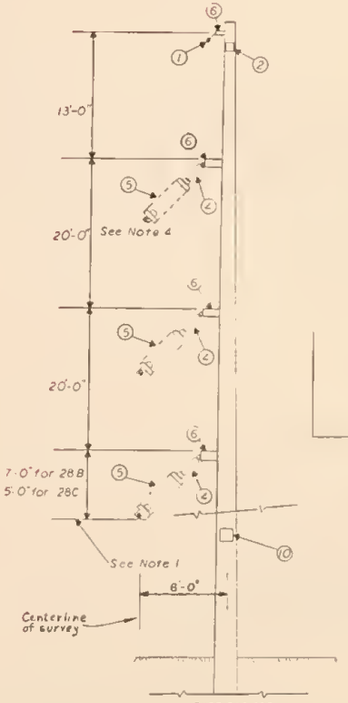
NOTES

1. Structure heights shown on plan and profile drawings are from ground line to the bottom conductor.
2. Insulator assembly, OGW assembly, and sign mounting details shall be determined by the contractor
3. Aerial patrol and structure number signs shall be attached to the structure faces as shown. Aerial patrol signs shall be attached with the top of the sign approximately one foot below the overhead ground wire. Structure number signs shall be ten feet above the ground. All signs shall have two mounting bolts at the locations shown on Detail A.
4. Insulator and OGW assemblies shall include a yoke and two suspension clamps for angles in excess of 20°.
5. Grounding of the structure shall be in accordance with drawing 411015.

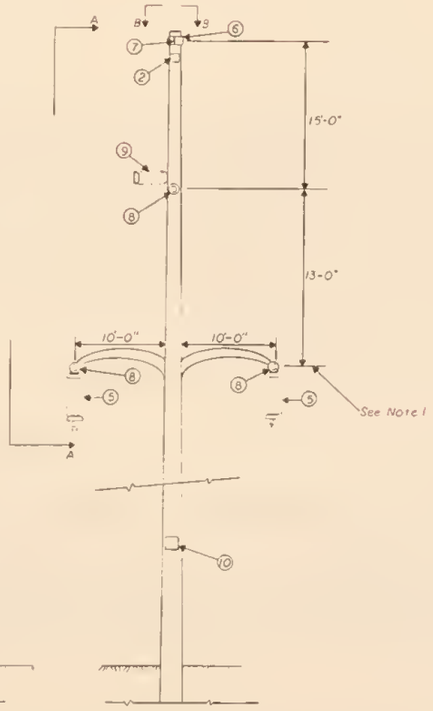


TYPE 28L, 28S, 28X

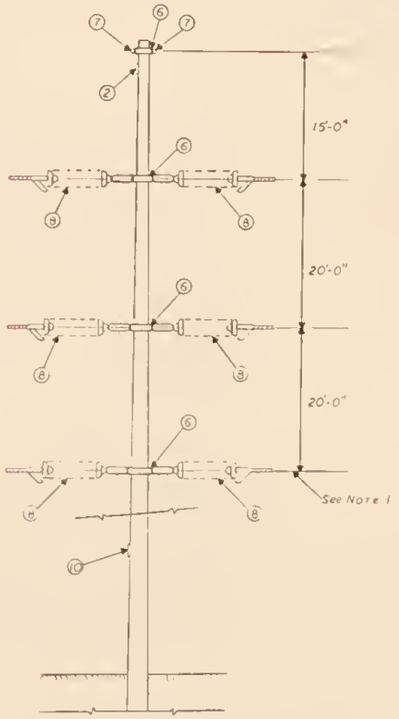
TYPE 28A



TYPE 28B, 28C



TYPE 28O



TYPE 28Y

NOT TO SCALE

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS — GOLDEN, COLORADO

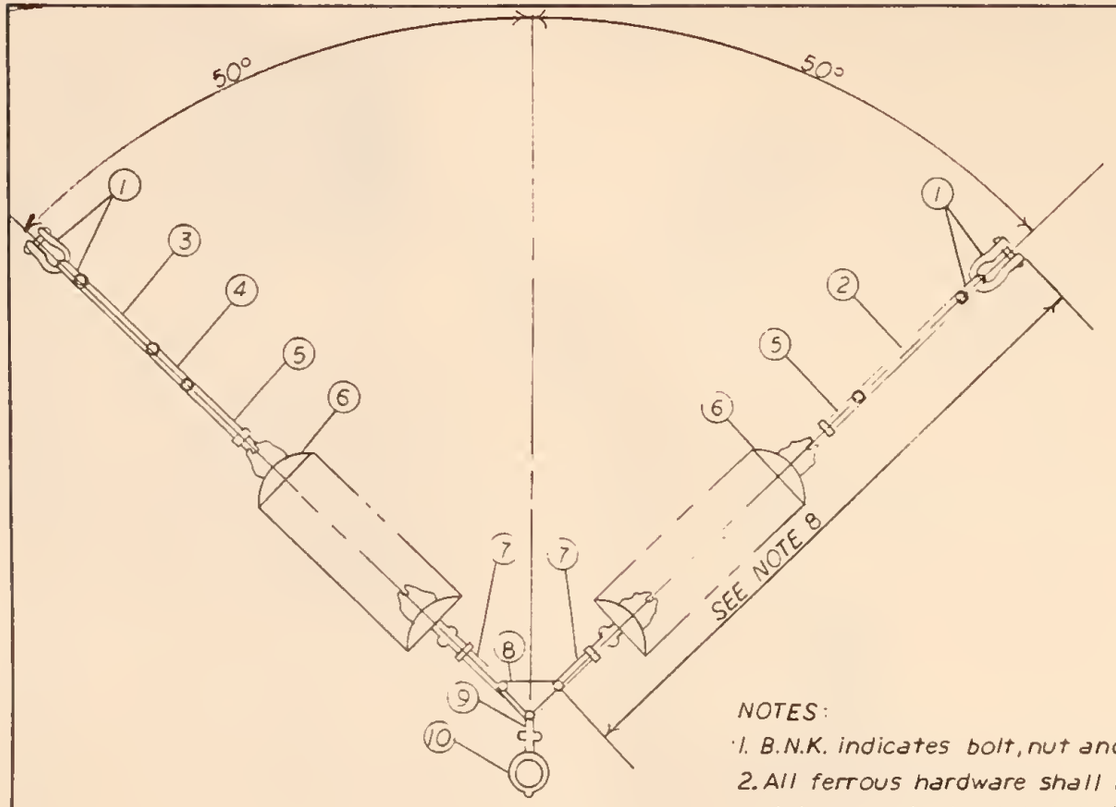
GREAT FALLS – CONRAD
230 KV TRANSMISSION LINE
MONTANA

MATERIAL ATTACHMENT DETAILS FOR STEEL AND CONCRETE POLE STRUCTURES

DESIGNED N.K. Hiatt — RECOMMENDED
DRAWN R. Cushing — APPROVED
CHECKED — CHIEF, POWER BRANCH

APRIL 27, 1984 | GTF — CON | T100

15



NOTES:

1. B.N.K. indicates bolt, nut and stainless steel cotter key required.
2. All ferrous hardware shall be heat treated, except that yoke plates may be heat treated at contractors option.
3. All ferrous materials shall be galvanized after drilling and forging in accordance with A.S.T.M. Designation A-153.
4. Strength of hardware components shall be equal to or greater than that of the reference item.
5. Yoke plate may be manufactured of either ferrous or aluminium alloy.
6. Turnbuckles shall be adjusted until the yoke plate assumes a horizontal position.
7. The contractor shall furnish hardware items in lengths which will result in a 100° V-String.
8. The overall dimension of the leg shall be based on structure arm pattern and shall comply with the clearance requirements as shown on Dwg. GTF-CON 1003.

MATERIAL LIST

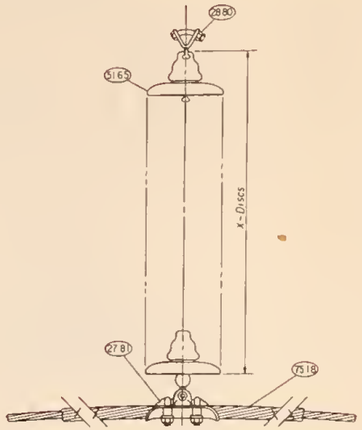
ITEM	QTY.	DESCRIPTION	MANUFACTURE/CAT NO. (or equal)
1	4	ANCHOR SHACKLE B.N.K.	BETHEA ASH-55-BC
2	1	EYE EYE STRAP (length as req'd.)	BETHEA TYPE C-36 min. 30,000 lb.
3	1	TURNBUCKLE, JAW-EYE 6" TAKEUP B.N.K.	BETHEA TYPE G-227-N min 30,000 lb.
4	1	EYE-EYE STRAP (length as req'd)	BETHEA TYPE C-36 min. 30,000 lb.
5	2	CLEVIS-BALL, HOT LINE B.N.K.	BETHEA CBHL-55A-BC
6	28	SUSPENSION INSULATOR 14 UNITS/LEG ANSI CLASS 52-3	
7	2	SOCKET Y-CLEVIS, HOT LINE B.N.K.	BETHEA SYCHL-56A
8	1	YOKE PLATE	BETHEA ASM-6645-2
9	1	Y-CLEVIS EYE B.N.K.	BETHEA RYCE-65-1000
10	1	SUSPENSION CLAMP B.N.K.	BETHEA LS-3-N

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS - GOLDEN, COLORADO

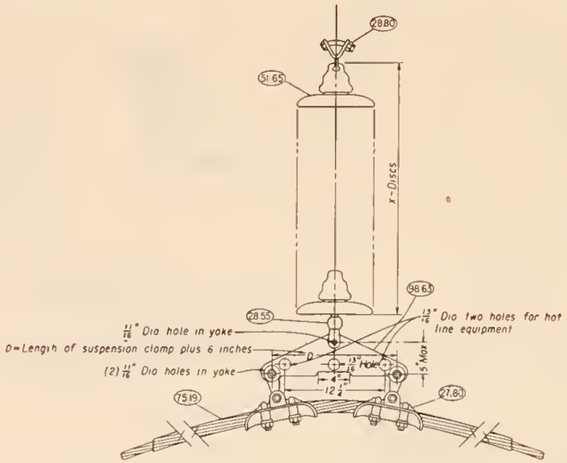
GREAT FALLS-CONRAD
230 KV TRANSMISSION LINE
MONTANA
V-STRING ASSEMBLY
MATERIAL AND ATTACHMENT DETAILS

DESIGNED N.K. Scott RECOMMENDED A.R. Eggert
DRAWN B. Lyon APPROVED Chas. Estes
CHECKED Neil Rauf Chief, Power Branch

APRIL 27, 1984 | GTF-CON | 1001



SINGLE STRING SUSPENSION ASSEMBLY
ULTIMATE STRENGTH 30,000 POUNDS



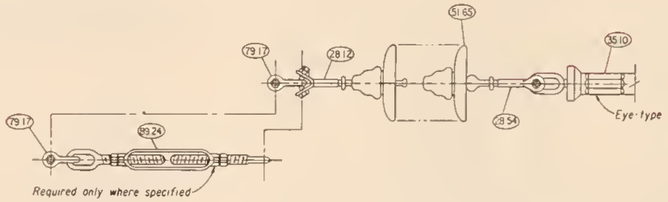
SINGLE SUSPENSION INSULATOR WITH YOKE
ULTIMATE STRENGTH 30,000 POUNDS

LIST OF MATERIALS

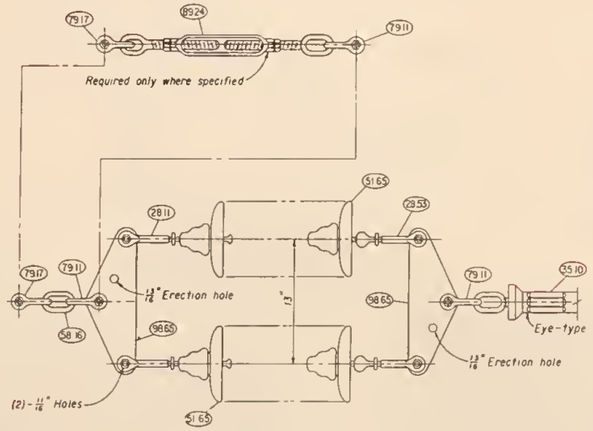
*	ITEM NO	DESCRIPTION	REFERENCE
	27.80	Clamp, suspension, with clevis fitting, for conductor	
	27.81	Clamp, suspension, with socket fitting, for conductor	
	28.11	Clevis-ball, hot line type fitting, for conductor	BT-3094-1
	28.12	Y-Clevis-ball, hot line type	BT-3091
	28.53	Socket-clevis, hot line type	BT-3087
	28.54	Socket-Y-clevis, hot line type	BT-3096
	28.80	Clevis, Y-ball	41 1005
	35.10	Compression deadend, eye fitting (chain type)	
	51.65	Insulator, suspension type, 10" diameter, 5 3/4" spacing	
	58.16	Chain link	41 1005
#	75.18	Rods, armor, preformed, single support	
#	75.19	Rods, armor, preformed, double support	
	79.17	V-Shackle, Lindsey Cat No 3203 or equal	
	89.24	Turnbuckle, eye-eye, 12" takeup, with jam nuts	BT-3177
△	98.63	Yoke, 5/8" thick	
△	98.65	Yoke, 1" thick	BT-B511MT
	79.11	Shackle, anchor type	BT-3025
	28.55	Socket-clevis	BT-3040

NOTES

1. All ferrous hardware shall be heat treated, except that yoke plates may be heat treated at the contractors option
2. All ferrous material shall be galvanized after drilling and forging in accordance with A.S.T.M. Designation A-153
3. Strength of hardware components in a sub-assembly shall be equal to or greater than the strength of the insulator units in that sub-assembly. The over-all strength of the complete insulator assemblies shall be as indicated



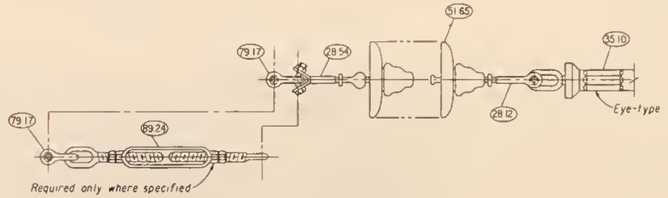
SINGLE TENSION INSULATOR ASSEMBLY WITH CAPS TOWARD STRUCTURE
ULTIMATE STRENGTH 30,000 POUNDS
(Use only when specified)



DOUBLE STRING TENSION ASSEMBLY FOR SINGLE CONDUCTOR
ULTIMATE STRENGTH 45,000 POUNDS

LEGEND

△ Yokes shall have full radius edges and corners
* All hardware fittings to be furnished with hexbolt, hexnut and key
# Used only when specified



SINGLE TENSION INSULATOR ASSEMBLY WITH CAPS AWAY FROM STRUCTURE
ULTIMATE STRENGTH 30,000 POUNDS
(Use only when specified)

VOLTAGE K.V	X-DISCS PER STRING	
	TENSION ASSEMBLY	SUSPENSION ASSEMBLY
34.5	5	4
69	7	6
115	10	9
138	11	10
161	12	11
230	15	14

C	9-3-80 A2-AJE	REVISED REFERENCE NUMBERS
B	1-16-80 A2-AJE	REVISED V-SHACKLE REFERENCE
A	8-6-79 A2-AJE	ADDED WAPA DRAWING NUMBER AND REVISED TITLE BLOCK

ALWAYS THINK SAFETY

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION

STANDARD DESIGN

TRANSMISSION LINES
INSULATOR ASSEMBLY DETAILS FOR STEEL TOWERS

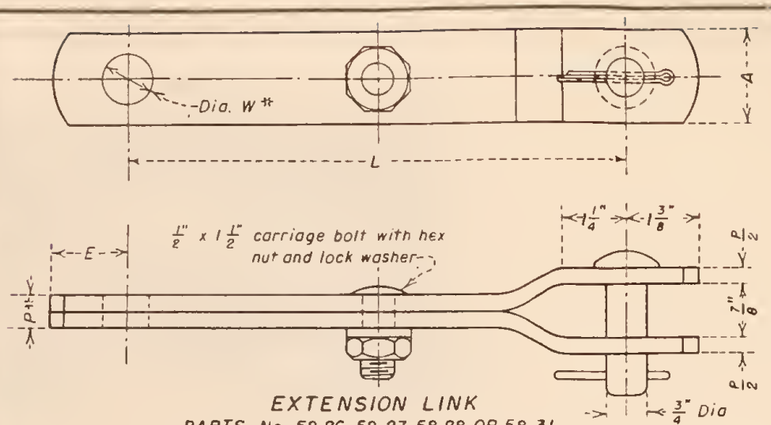
DESIGNED EPP-ADS SUBMITTED
DRAWN WLD RECOMMENDED
CHECKED EP APPROVED
CHIEF, ELECTRICAL DESIGN BRANCH

GOLDEN, COLORADO JUNE 19, 1978

E40-D-4683

AUGUST 6, 1979 | 41 | 1001

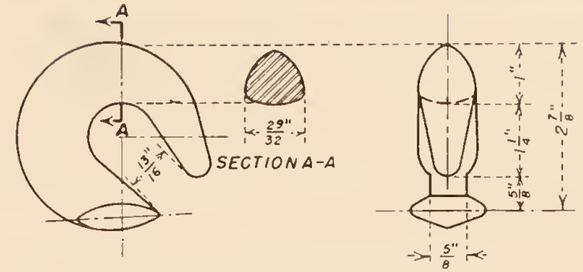
17



EXTENSION LINK

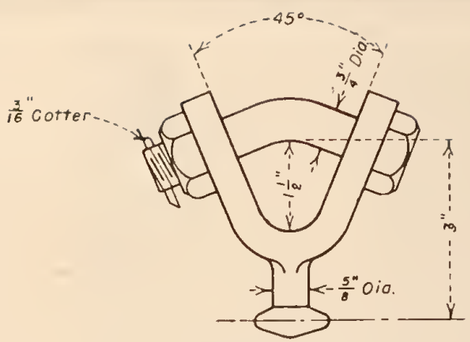
PARTS No. 58.26, 58.27, 58.28 OR 58.31
(SEE TABLE BELOW FOR DIMENSIONS)

TYPE DEAD END	CONDUCTOR	STRANDING	P *	W * DIAMETER	A MIN. WIDTH	E ** MAX.	EXTENSION LINKS, LENGTH "L" FOR THE FOLLOWING DEFLECTION ANGLES 40°-52°	52°-60°	60°-70°	70°-90°	PART NO.	"L"	ULTIMATE STRENGTH
STRAIN CLAMP OR COMPRESSION DEAD END	4/0	6/1	1/2"	11/16"	1 3/4"	1"	34"	24"	14"	11"	58.26 a	11"	18,000 **
	266,800	26/7	1/2"	11/16"	1 3/4"	1"	34"	24"	14"	11"	58.26 b	14"	
											58.26 c	24"	
	300,000	26/7	1/2"	11/16"	1 3/4"	1"	34"	24"	14"	11"	58.26 d	34"	
	336,400	26/7	3/4"	13/16"	2"	1 1/2"	34"	24"	14"	11"	58.27 a	11"	25,000
											58.27 b	14"	
	397,500	26/7	3/4"	13/16"	2"	1 1/2"	34"	24"	14"	11"	58.27 c	24"	
											58.27 d	34"	
	477,000 TO 636,000	24/7 & 26/7	1"	1 1/16"	2"	1 1/2"	34"	24"	14"	11"	58.28 a	11"	30,000
											58.28 b	14"	
											58.28 c	24"	
											58.28 d	34"	
COMP DEAD END	795,000	45/7	1"	1 1/16"	2"	1 1/2"	34"	24"	14"	11"			
	795,000	26/7	1 1/4"	1 3/16"	2"	1 1/2"	34"	24"	14"	11"	58.31 a	11"	30,000
	954,000 TO 1,192,500	ALL	1 1/4"	1 3/16"	2"	1 1/2"	34"	24"	14"	11"	58.31 b	14"	
											58.31 c	24"	
											58.31 d	34"	



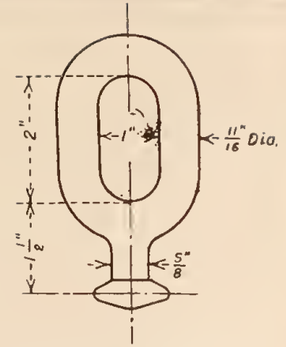
SUSPENSION HOOK

(Locking Type)
PART No. 48.10
ULTIMATE STRENGTH 25,000 LBS.



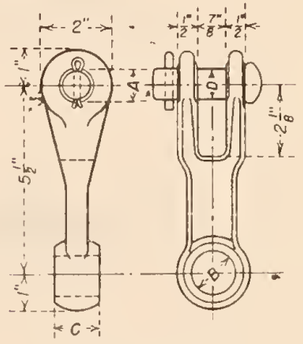
"Y"-BALL CLEVIS

PART No. 28.80
ULTIMATE STRENGTH 25,000 LBS.



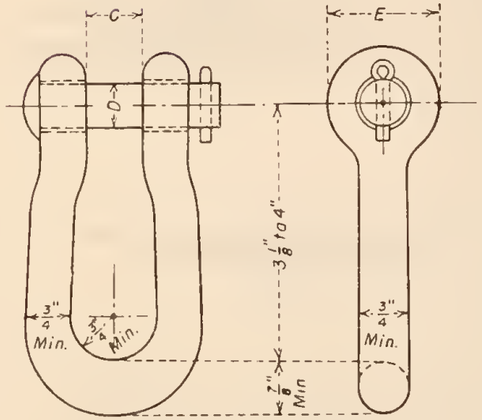
BALL EYE CONNECTOR

PART No. 38.10
ULTIMATE STRENGTH 25,000 LBS.



CLEVIS-EYE

SEE TABLE OF DIMENSIONS
PART NO. 38.19, 38.20, 38.21, 38.22, 38.23, 38.24
ULTIMATE STRENGTH 30,000 LBS.



ANCHOR SHACKLE

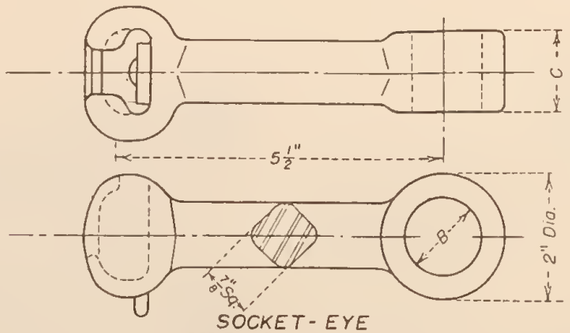
PART NO. 79.11 AND 79.15
ULTIMATE STRENGTH 30,000 LBS.

NOTES

Fittings are to be forged steel (except extension link)
All material shall be galvanized after drilling and forging in accordance with A.S.T.M. Designation A153.

* Dimensions "P", "W", "B," and "C" are based on Aluminum Co. of America compression dead-ends. For use with strain clamps, dimensions "W" and "B" shall be 1/16-inch more than the pin size of clevis fitting. Dimension "C" and "E" shall be adequate to insure proper fit in clevis fitting.

** Ultimate strength of Items No. 58.26a, 58.26b, 58.26c, and 58.26d to be 25,000 lbs. when used with double yoke tension insulator assemblies.



SOCKET-EYE

SEE TABLE OF DIMENSIONS
PART NO. 38.52, 38.53, 38.54, 38.55
ULTIMATE STRENGTH 30,000 LBS.

TABLE OF DIMENSIONS FOR CLEVIS-EYE AND SOCKET-EYE

CONDUCTOR SIZE	STRANDING	TYPE DEADEND	PART NO.	A	B *	C *	D
266.8, 300.0	26/7	COMPRESSION	38.19, 38.52	13/16"	11/16"	11/16"	3/4"
336.4, 397.5	26/7	COMPRESSION	38.20, 38.53	13/16"	13/16"	3/4" to 13/16"	3/4"
477.0 TO 636.0	24/7 TO 26/7	COMPRESSION	38.21, 38.54	13/16"	1 1/16"	1" to 1 1/16"	3/4"
795.0	45/7						
795.0	26/7	COMPRESSION	38.22, 38.55	13/16"	1 3/16"	1 1/4"	3/4"
954.0 TO 1192.5	ALL						
SPECIAL			38.23	15/16"	1 3/16"	1 1/4"	7/8"
ALL		STRAIN CLAMP	38.24	13/16	*	*	3/4

TABLE OF DIMENSIONS FOR ANCHOR SHACKLE

PART NO.	C	D	E
79.11	7/8"	3/4"	1 3/4"
79.15	1 3/8"	1"	2 1/8"

SLOWDOWN THINK SAFETY

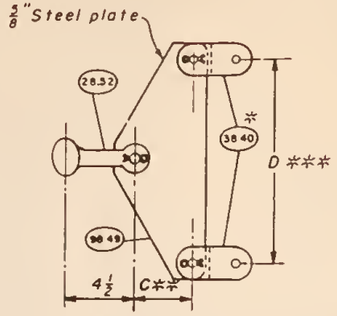
A	8-6-79	ADDED WAPA DRAWING NUMBER AND AE-8 REVISED TITLE BLOCK

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
STANDARD DESIGNS
TRANSMISSION LINES
INSULATOR HARDWARE DETAILS

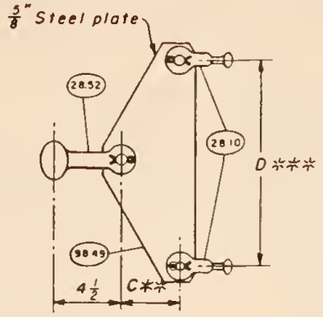
DESIGNED F.E.P. SUBMITTED
DRAWN E.V.M. RECOMMENDED
CHECKED A.J.E. APPROVED L. R. Lahti
CHIEF, ELECTRICAL DESIGN BRANCH

GOLDEN, COLORADO AUGUST 16, 1978 | E4G-D-3182

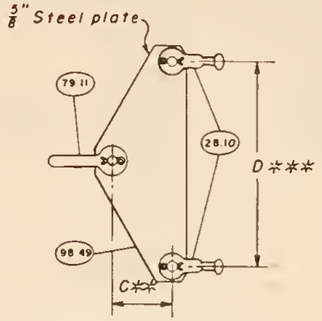
AUGUST 6, 1979 | 41 | 1003



PART NO. 98.53
FOR TYPE 3A AND 3AB STR'S
SINGLE STRING - FOR ANGLE
20° TO 60°

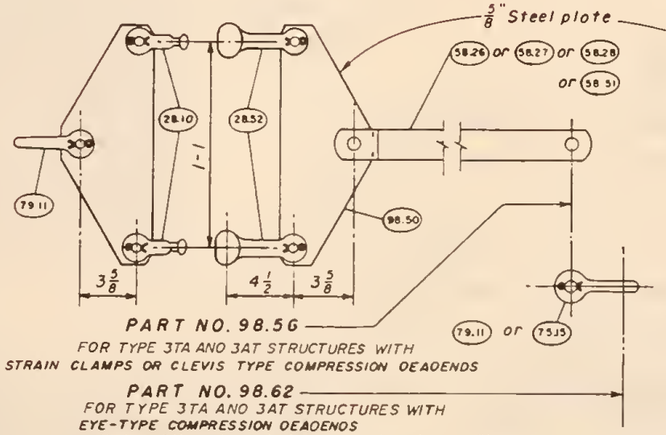


PART NO. 98.54
FOR TYPE 3AB STRUCTURE
DOUBLE STRING



PART NO. 98.55
FOR TYPE 3A STRUCTURE
DOUBLE STRING

SINGLE YOKE ASSEMBLIES



PART NO. 98.56
FOR TYPE 3TA AND 3AT STRUCTURES WITH
STRAIN CLAMPS OR CLEVIS TYPE COMPRESSION DEADENDS

PART NO. 98.62
FOR TYPE 3TA AND 3AT STRUCTURES WITH
EYE-TYPE COMPRESSION DEADENDS

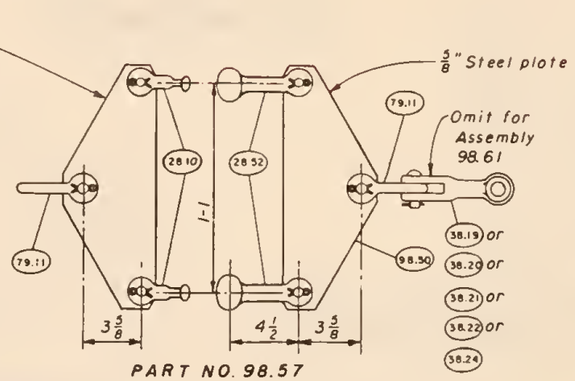
Note: All moteriol shall be golvonized ofter drilling and forging in accordance with A.S.T.M. Designotion A153.

Ultimate strength of completed assemblies shall be not less thon 25,000 lbs. for 397,500 CM ACSR, ond smoller, ond 30,000 lbs. for ACSR larger thon 397,500 CM.

* Thickness of eye end of Port No. 38.40 sholl be odequote to insure proper fit in conductor suspension clomp.

** Width as required to obtain specified strength.

*** Length of suspension clomp plus 10 inches.



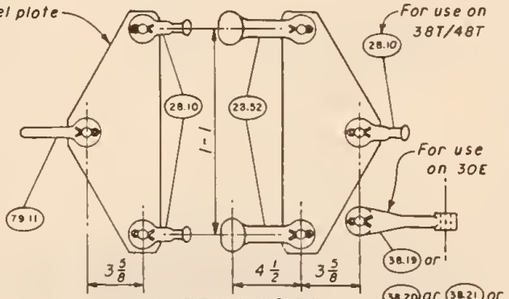
PART NO. 98.57
FOR TYPE 3TA, 3T AND 3TX STRUCTURES (AS SHOWN)
FOR TYPE 4SWT STRUCTURE (HARDWARE ARRANGEMENT PER DWG. NO. 41 6005)

PART NO. 98.61
(Some as port No. 98.57, except omit 90° clevis-eye)
FOR USE WITH EYE TYPE COMPRESSION DEAD ENDS ONLY, IN LIEU OF PART NO.'S 98.57, 98.58 AND 98.59

DOUBLE YOKE ASSEMBLIES

LIST OF MATERIAL

PART NO.	ASSEMBLY PART NO. 98.53	98.54	98.55	98.56	98.57	98.58	98.59	98.61	98.62	DESCRIPTION	DWG. NO. 41
79.11 or 79.15									1	Use 79.11 with 58.28 Use 79.15 with 58.31	1003
28.10		2	2	2	2	3	2	2	2	Clevis, ball	
28.52	1	1		2	2	2	2	2	2	Clevis, socket, 4 1/2" long	
38.40	2									Eye, clevis *	
58.26 .27 28 or 31				1					1	Link, extension	1003
79.11			1	1	2	1	1	2	1	Shackle, anchor	1003
98.49	1	1	1							Yoke plate	
98.50				2	2	2	2	2	2	Yoke plate, strain	
38.19 or 38.20 or 38.21 or 38.22 or 38.24					1		1			Eye, clevis, 5 1/2" long, 90°	1003



PART NO. 98.58
FOR TYPE 38T/48T STRUCTURE

PART NO. 98.59
FOR TYPE 30E STRUCTURE

B	8-17-89 AZ-	CHANGED REFERENCE DRAWING NUMBERS
A	8-6-79 AZ-	ADDED WAPA DRAWING NUMBER AND REVISED TITLE BLOCK

ALWAYS THINK SAFETY

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION

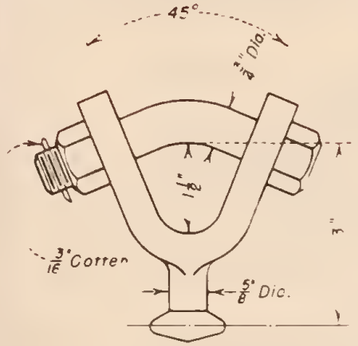
STANDARD DESIGNS
TRANSMISSION LINES
STRAIN YOKES AND YOKE ASSEMBLIES

DESIGNED F.F.P. SUBMITTED
DRAWN S.C.S RECOMMENDED
CHECKED K.J.O-W.N.C. APPROVED
CHIEF, ELECTRICAL DESIGN BRANCH

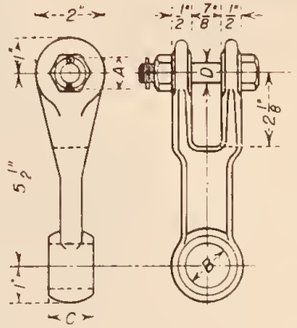
GOLDEN, COLORADO AUGUST 23, 1978 | E40-D-5280

AUGUST 6, 1979 | 41 | 1004

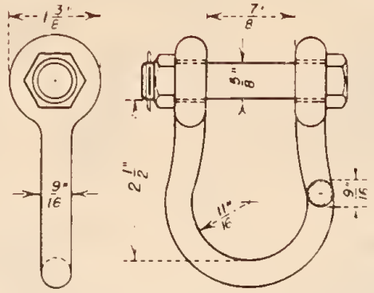
19



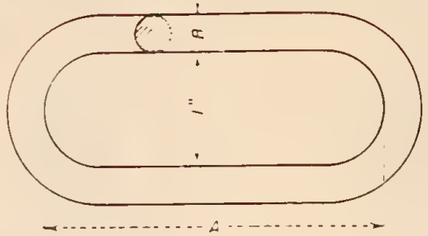
"Y" – BALL CLEVIS
PART NO 28 82
ULTIMATE STRENGTH 25,000 LBS



CLEVIS – EYE
SEE TABLE OF DIMENSIONS
PART NO. 38 19. 38.20, 38 21, 38.22, 38.24
ULTIMATE STRENGTH 33,000 LBS.

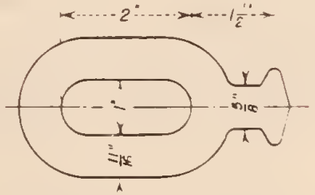


ANCHOR SHACKLE
PART NO 79.13
ULTIMATE STRENGTH 25,000 LBS

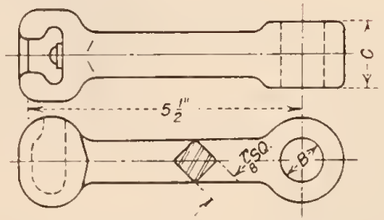


CHAIN LINK
PART NO 58.15, 58.16

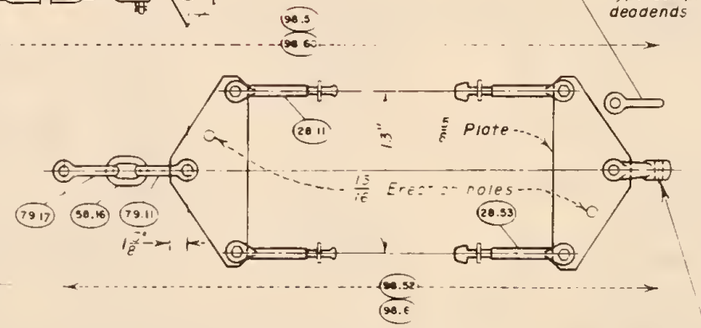
PART NO.	A (MIN.)	B (MIN.)	ULT. STRENGTH
58.15	2 1/4	1/2"	25,000 LBS.
58.16	2 7/8	5/8"	33.000 LBS.



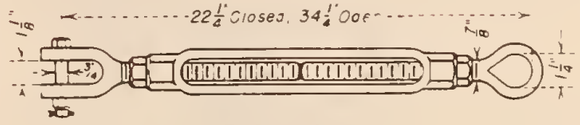
BALL EYE
PART NO. 38 IC
ULTIMATE STRENGTH 25.000 LBS



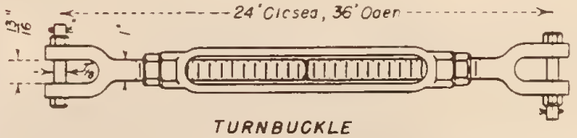
SOCKET – EYE
PART NO 38 52, 38.53, 38.54, 38.55
ULTIMATE STRENGTH 33,000 LBS.



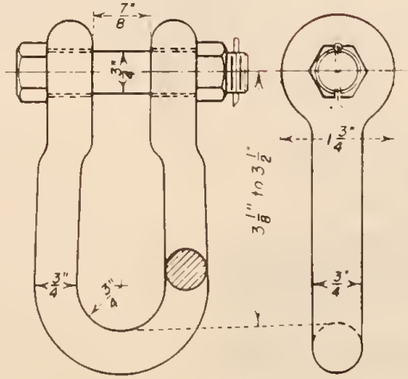
DOUBLE YOKE ASSEMBLIES
PART NO 98.51. 98.52. 98 60. 98 61
ULTIMATE STRENGTH 33.000 LBS



TURNBUCKLE
PART NO 89.20
ULTIMATE STRENGTH 25.000 LBS



TURNBUCKLE
PART NO 89 25
ULTIMATE STRENGTH 33.000 LBS.



ANCHOR SHACKLE
PART NO. 79 11
ULTIMATE STRENGTH 36,000 LBS

EXPLANATION

** For use with strain clamps, dimensions 'B' and 'C' shall be suitable and adequate to fit clevis fitting of strain clamp.

* Turnbuckles required only where specified. All material shall be galvanized after drilling and forging in accordance with A.S.T.M. Designation A-153.

Δ Fittings based on ALCOA conductor area – ends.

‡ Yokes shall have full radius edges and corners, hot-line fittings shall be heat treated, with 30,000 # ultimate strength.

For use with compression, clevis type, deadends Δ

- (38.19) 266.8, 300.0 MCM 26/7
- (38.20) 336.4, 397.5 MCM 26/7
- (38.21) 477.0, 556.5 MCM 24/7; 605.0. 636 0 MCM 26/7; 795.C MCM 45/7
- (38.22) 795.0 MCM 26/2; 954.0 to 1272 MCM All strandings
- (38.24) For use with strain clamps

	PART NO.	DESCRIPTION
‡	28 11	Clevis, Ball, Hot line type
‡	28.53	Clevis, Socket, Hot line type
	28.80	Clevis, Y-Ball
	38 19	Eye, Clevis, 5 1/2" long, 90° see table below
	38 20	Eye, Clevis, 5 1/2" long, 90°, see table below
	38 21	Eye, Clevis, 5 1/2" long, 90°, see table below
	38.22	Eye, Clevis, 5 1/2" long, 90°, see table below
	38.24	Eye, Clevis, 5 1/2 long, 90°, see table below
	58 15 58 16	Link, Chain
	79 11 79 13	Shackle, Anchor type
	79 17	V-Shackle, Lindsey Cat. No. 3203 or Equal.
*	89.20	Turnbuckle, Clevis - Eye, 7/8, 12" Take - Up
*	89.25	Turnbuckle, Clevis - Clevis, 1", 12" Take - Up
*	98 51	Yoke, Strain, Double assembly, with turnbuckle
	98 52	Yoke, Strain, Double assembly, without turnbuckle
	38 10	Eye, Ball
	38 52 38 53 38.54 38.55	Eye, Socket, 5 1/2" long. see table below
‡	98.60	Yoke, Strain, Double assembly, with turnbuckle
‡	98.61	Yoke, Strain, Double assembly, without turnbuckle

TABLE OF DIMENSIONS FOR CLEVIS-EYE AND SOCKET-EYE

PART NO.	A	B	C	O
38 19, 38.52	13/16"	11/16"	11/16"	3/4"
38.20, 38.53	13/16"	13/16"	3/4" to 13/16"	3/4"
38.21, 38.54	13/16"	1 1/16"	3/4" to 1 1/16"	3/4"
38.22, 38 55	13/16"	1 3/16"	1 1/4"	3/4"
38.24	13/16"	**	**	3/4"

B	6-24-81 A2-	CHANGED DRAWING REFERENCE ON PART NO. 79 1"
A	8-6-79 A2-	ADDED WAPA DRAWING NUMBER AND REVISED TITLE BLOCK

ALWAYS THINK SAFETY

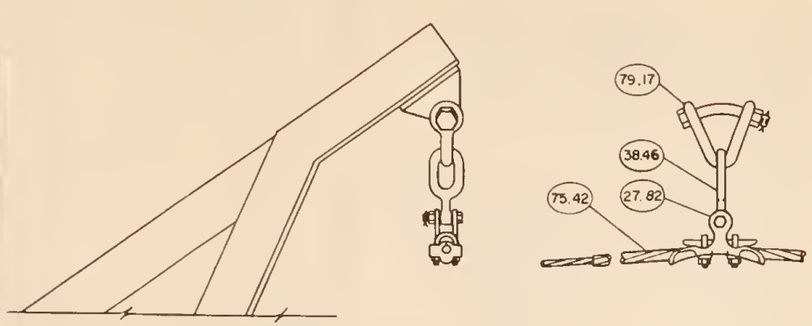
UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION

STANDARD DESIGNS
TRANSMISSION LINES
STEEL TOWERS
CONDUCTOR AND OVERHEAD GROUND WIRE HARDWARE DETAILS

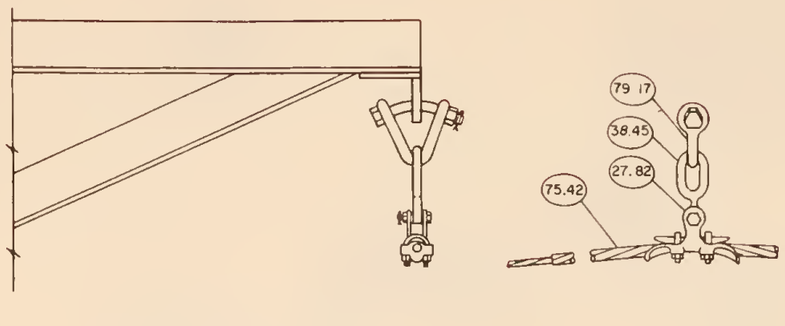
DESIGNED ADS-EMF SUBMITTED
DRAWN M.E.W. RECOMMENDED
CHECKED C.A.C. APPROVED
CHIEF, ELECTRICAL DESIGN BRANCH

GOLDEN, COLORADO AUGUST 23, 1978 | E40-D-5271

AUGUST 6, 1979 | 41 | 1005



DETAIL A
(OGW ATTACHMENT PLATE
AT RIGHT ANGLE TO OGW)



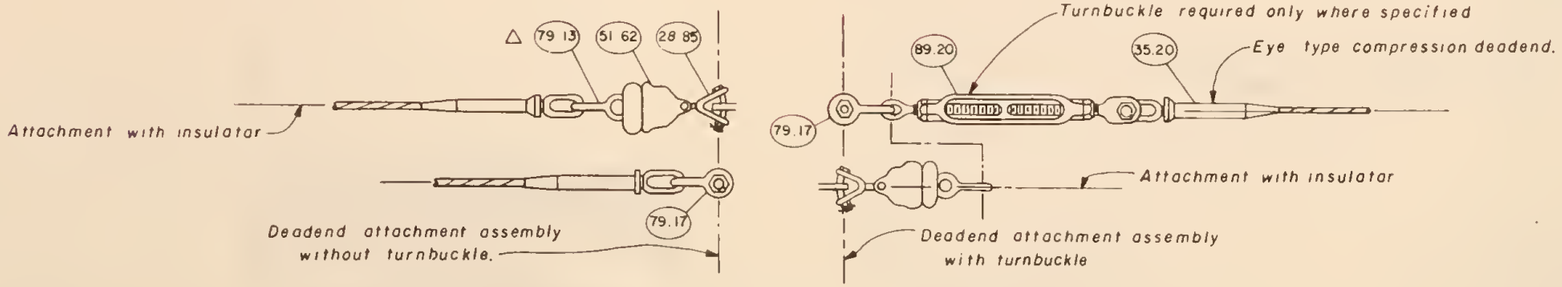
DETAIL B
(OGW ATTACHMENT PLATE
IN PLANE OF OGW)

* PART NO.	DESCRIPTION	DWG.NO. 41
27 82	Clamp suspension	
28 85	Y - Clevis eye, O B 85450 or equal	
35 20	Deadend compression, eye type	
38.45	Eye, Oval eye, B.T.-3007-T or equal	
38 46	Eye, Oval eye 90°, B.T.3007 or equal.	
51.62	Insulator, ground wire, as specified.	
75 42	Rods, armor, performed for steel O G W	
79.13	Shackle, anchor type.	1005
79 17	V-Shackle, Lindsey Cat No 3203 or equal	
89.20	Turnbuckle, clevis-eye	1005

NOTES

* All hardware fittings to be furnished with hex bolt, hex nut, and key

△ When strain clamp is used omit Part No 79.13



TOWER DEADEND ATTACHMENT

D	9-3-80 A2-	REVISED REFERENCE DRAWING NUMBERS
C	7-11-80 A2-	REVISED FOR MINOR REVISIONS
B	1-16-80 A2-	REVISED V-SHACKLE REFERENCE
A	6-6-79 A2-	ADDED WAPA DRAWING NUMBER AND REVISED TITLE BLOCK
E	10-28-83 A2-	CORRECTED PART NOS. 38.45 & 38.46, REVISED NOTES

ALWAYS THINK SAFETY

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION

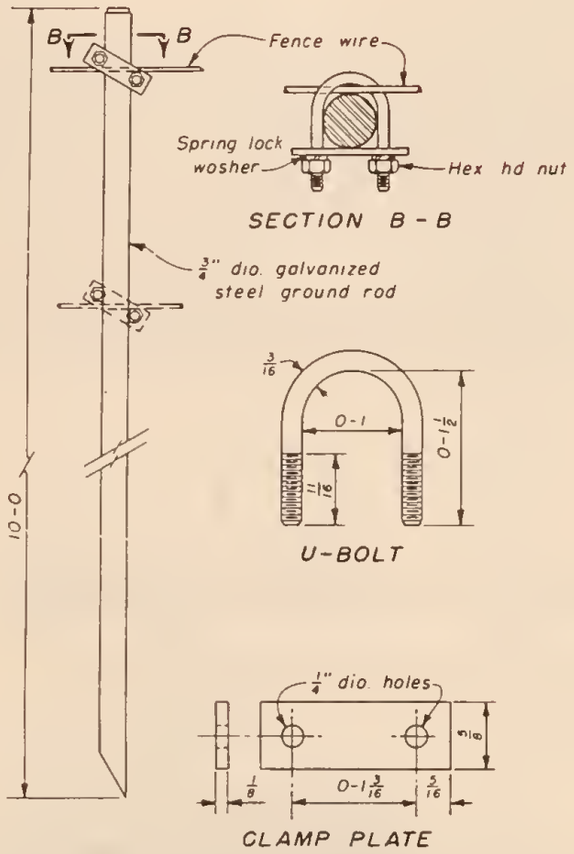
STANDARD DESIGNS
TRANSMISSION LINES
STEEL TOWER
OVERHEAD AND GROUND WIRE ATTACHMENT DETAIL

DESIGNED E.F.P. SUBMITTED
DRAWN E.M.R. RECOMMENDED
CHECKED K.T.O. APPROVED
CHIEF, ELECTRICAL DESIGN BRANCH

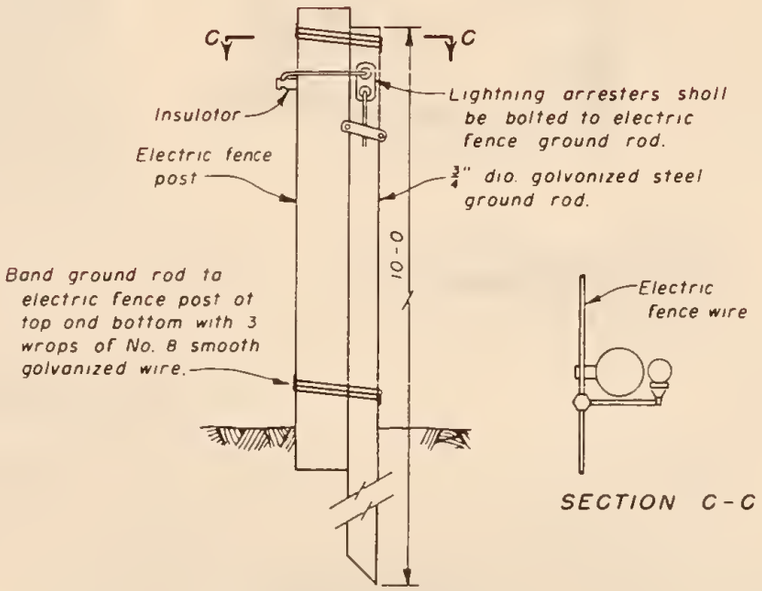
GOLDEN, COLORADO JUNE 16, 1978 | E40-D-4422

AUGUST 6, 1979 | 41 | 1006

21



NON-ELECTRIC FENCE GROUNDING


C
C
Insulator
Electric fence post
Lightning arresters shall be bolted to electric fence ground rod.
3/4" dia. galvanized steel ground rod.
10-0
Band ground rod to electric fence post at top and bottom with 3 wraps of No. 8 smooth galvanized wire.
Electric fence wire
SECTION C-C

ELECTRIC FENCE GROUNDING

NOTES

1. Ground rods and hardware shall be made of steel and galvanized in accordance with A.S.T.M. Designation A 153.
2. Clamp assembly includes u-bolt, clamp plate, two spring lockwashers and two hex. nuts
3. Use one clamp assembly, for each fence wire.
4. Electric fences shall be grounded only through lightning arresters as shown. Lightning arresters shall be especially designed for use with electric fences. Ground rods shall be driven as close as possible to, and bonded to, electric fence posts.
5. Remove scale and rust and then coat with no-oxide compound, all fence wire surfaces which contact clamp assemblies.

A	8-6-79 A2-BFZ	ADDED WAPA DRAWING NUMBER AND REVISED TITLE BLOCK.

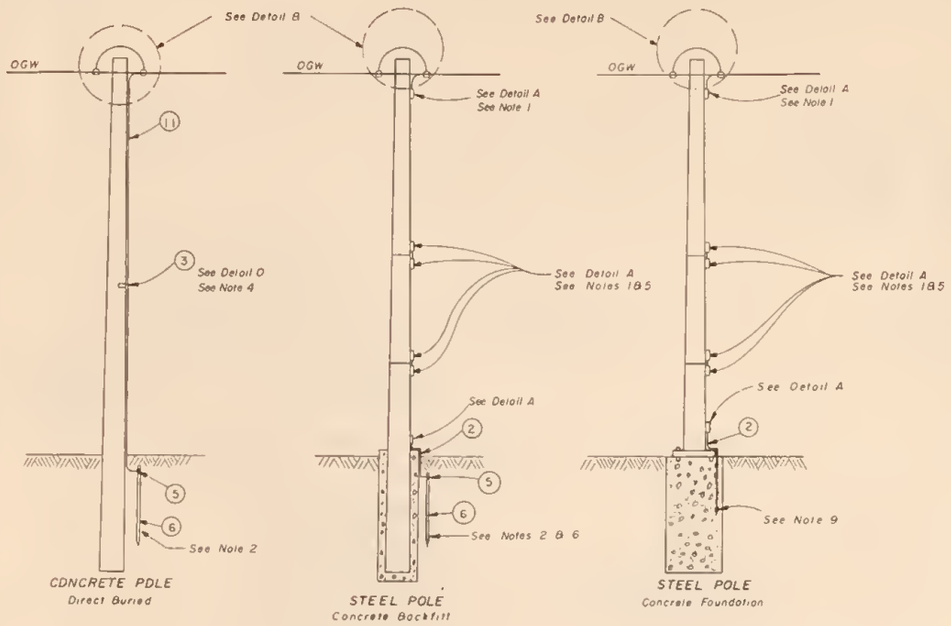
UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION

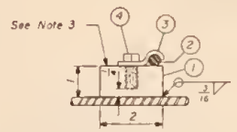
STANDARD DESIGNS
TRANSMISSION LINES
FENCE GROUNDING HARDWARE

DESIGNED W.W.D. SUBMITTED
DRAWN J.M.F. RECOMMENDED
CHECKED E.R.V. APPROVED
CHIEF, ELECTRICAL DESIGN BRANCH

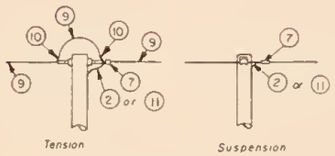
GOLDEN, COLORADO AUGUST 23, 1978 | E40-D-5017

AUGUST 6, 1979 | 41 | 1011

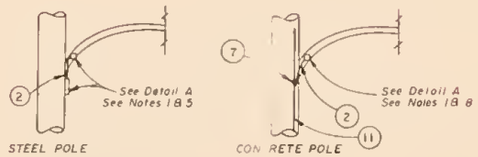




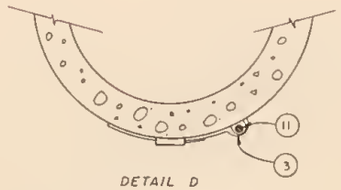
DETAIL A
Ground Plate Detail



DETAIL B
Overhead Ground Wire
Grounding Detail



DETAIL C
Davit Arm Grounding Detail



DETAIL D
Structure Ground Wire Attachment
To Step lug or Climbing Clip
(For Concrete Only)
See Note 4

MATERIAL LIST

ITEM NO	DESCRIPTION
1	Ground Plate 2"x2"x1/4" center drilled and tapped for 1/2" bolt
2	Pigtail Jumper, No 2 AWG Copper wire, single strand
3	Ground Clip, suitable for No 2 AWG copper ground wire
4	1/2" Hexhead bolt, length as necessary to attach ground clip
5	Ground rod clamp
6	Ground rod, copper covered steel 3/4"x8'
7	Ground wire connector, 2-wire (Burndy Type KSU or equal)
8	Ground wire connector, 3-wire (Burndy Type KSU or equal)
9	Steel-strand, overhead ground wire
10	Compression Deadend with jumper pad
11	Concrete Pole Ground Wire No 2 AWG Copper wire, single strand

NOTES

1 Pigtail jumper lengths shall be limited to present as little hindrance to climbing as possible

2 The top of the ground rod shall be placed a minimum of 6" below ground level

3 Ground plates shall be fabricated from stainless steel plate

4 Ground clips shall be attached every 4 feet to a continuous length of ground wire along the entire exposed length of all concrete poles The location, spacing and details of steps or climbing clips are shown on the climbing provisions drawings

5 On painted and "weathering" steel poles, pigtail jumpers are required across all flange and slip-joints, between all davit arms and the pole, and between the line post insulators and the pole These pigtail jumpers are not required on galvanized steel poles

6 Ground rods are required on painted and "weathering" steel poles with concrete backfill Ground rods are not required on galvanized steel poles with concrete backfill

7 For poles which consist of both steel and concrete sections, there shall be a continuous ground wire running the full length of the concrete section This continuous ground wire shall be attached to the steel section by means of a ground plate

8 The splice plates and all conductor attachments (including davit arms and line post insulators) shall be attached to the ground wire on all concrete poles

9 On steel poles with a concrete foundation, the ground wire shall be connected to the steel reinforcement at the foundation with either a CADWELD or solid bolted connection

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS — GOLDEN, COLORADO

TRANSMISSION LINE STANDARDS

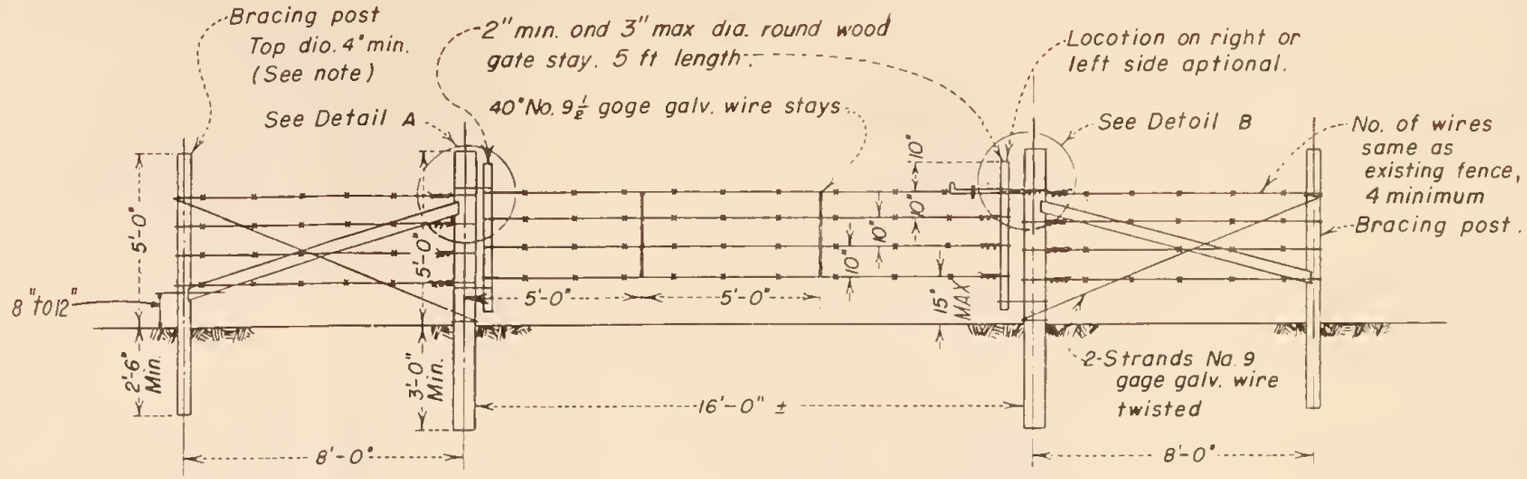
GROUNDING DETAILS

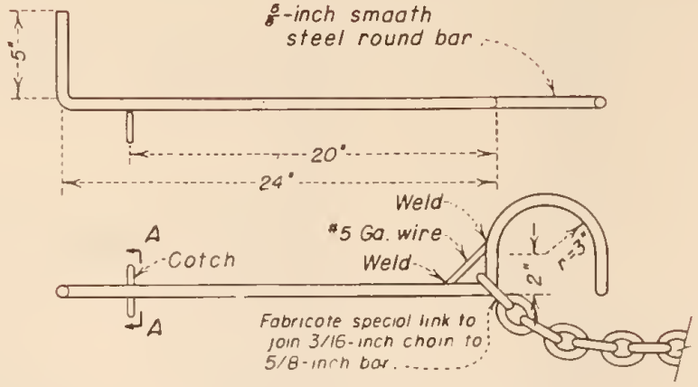
CONCRETE AND STEEL POLES

DESIGNED Neil Koup — RECOMMENDED Alan Lucas
DRAWN S.L. Harmon — APPROVED Lloyd Thorsley
CHECKED R.K. — DIRECTOR, DIVISION OF ELECTRICAL DESIGN

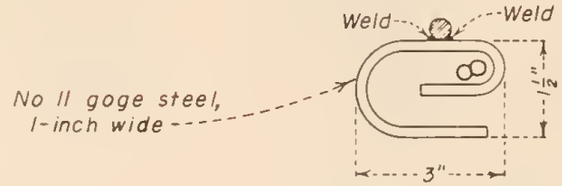
APRIL 20, 1984 | 41 | 1015

23

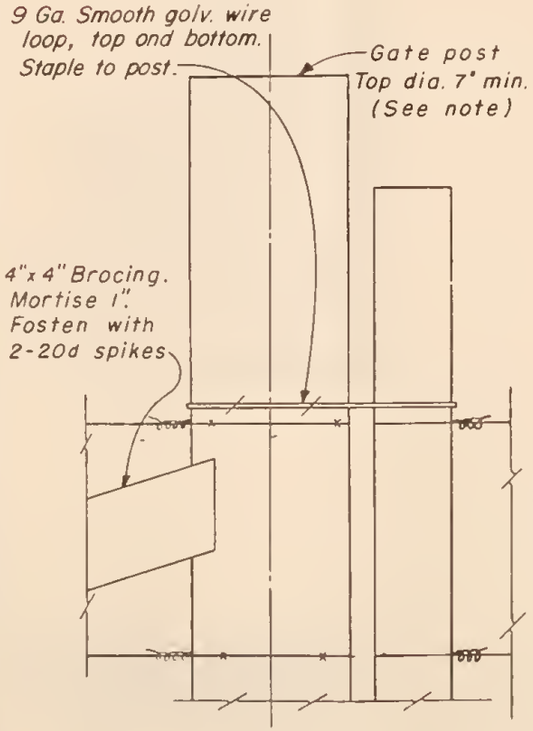




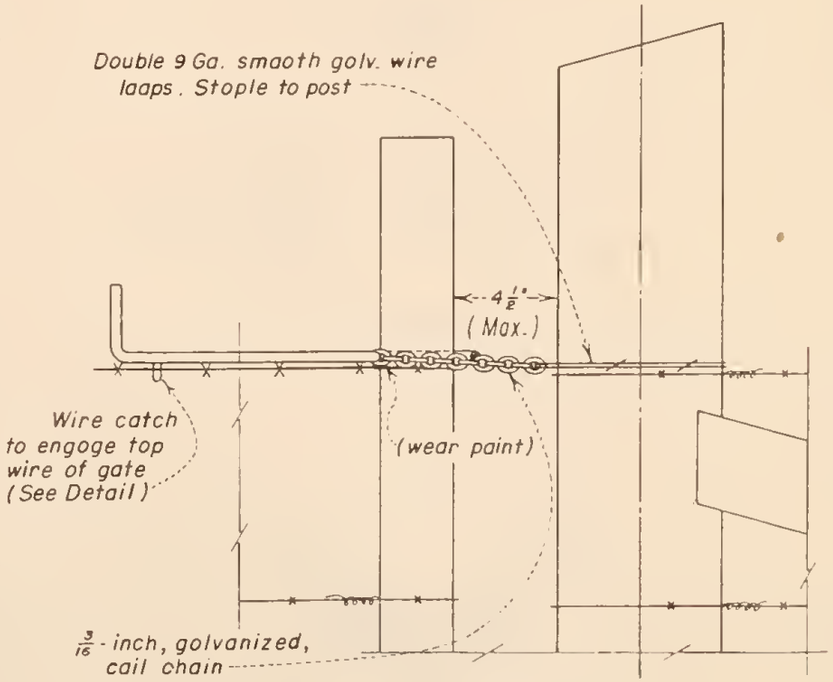
DETAIL OF GATE CLOSER



DETAIL OF CATCH
(Section A-A)



DETAIL A



DETAIL B

NOTES

Gate posts ond brocing posts are included as part of construction of the gate ond shall be well-seosoned cedor or o type that has been pressure treoted with o pre-servotive. The pressure treoted posts sholl be Douglas Fir, Western Lorch, Lodge-pale Pine, or Southern Yellow Pine.

Gate closer sholl be golvonized in occordonce with A.S.T.M. Designotion A-153.

D	8-17-83 A2-	REVISED DETAIL A
C	3-28-80 A2-	REVISED BRACING AND MINOR REVISIONS
B	1-16-80 A2-	REVISED NOTE ON NUMBER OF WIRES ON GATE
A	8-6-79 A2-	ADDED WAPA DRAWING NUMBER AND REVISED TITLE BLOCK

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION

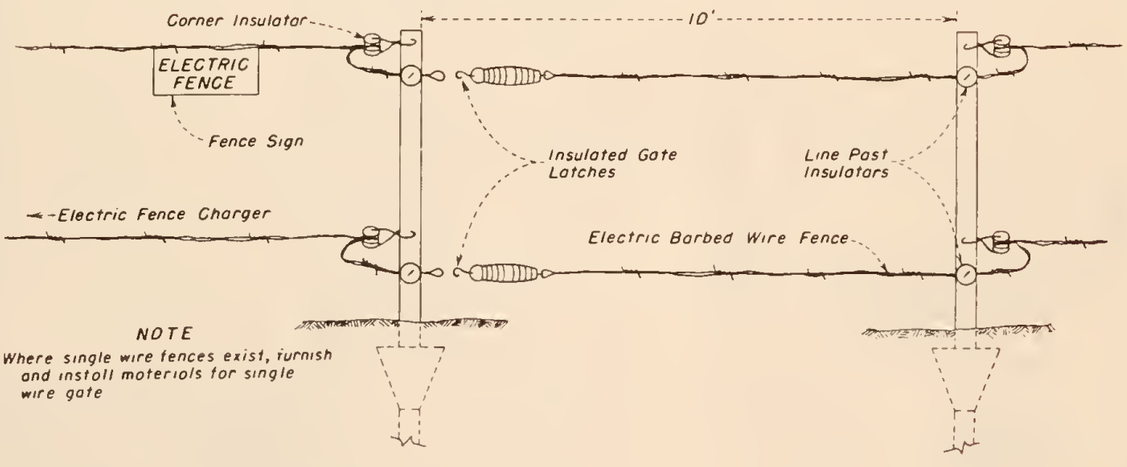
STANDARD DESIGNS

TRANSMISSION LINES
BARBED WIRE GATE FOR RIGHT-OF-WAY FENCES

DESIGNED M.A.B. SUBMITTED
DRAWN H.E.W. RECOMMENDED
CHECKED D.C.M.-K.T.D. APPROVED
CHIEF, ELECTRICAL DESIGN BRANCH

GOLDEN, COLORADO AUGUST 23, 1978 | E40-D-5108

AUGUST 6, 1979 | 41 | 9002



NOTE

Where single wire fences exist, furnish and install materials for single wire gate

LIST OF MATERIAL	
QUAN	DESCRIPTION
4	Bolt, "J" type, with wing nut
4	Insulator, corner
4	Insulator, line post
2	Latch, gate insulated
2	Post, angle, 3/4" x 3/4" x 7/64 — 4 1/2' High
1	Sign, electric fence, 4" x 8"
20 ft	Wire, barbed, 18-ga galv steel for elec fence

A	6-24-81 A2-	ADDED WESTERN TITLE BLOCK

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS – GOLDEN, COLORADO

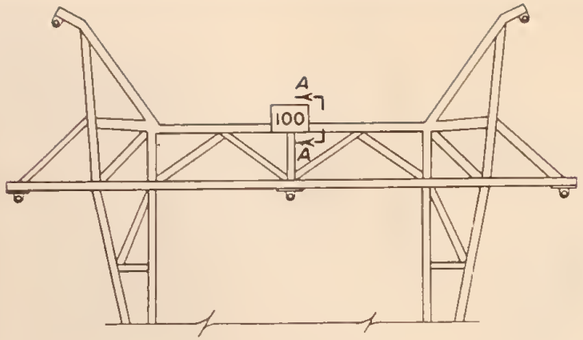
TRANSMISSION LINE STANDARDS
ELECTRIC BARBED WIRE GATE FOR RIGHT-OF-WAY FENCES

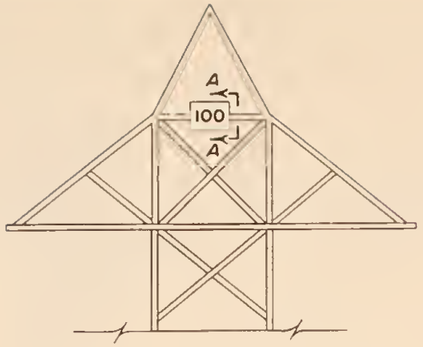
DRAWN SGP SUBMITTED M. H. Knight
TRACED TEB RECOMMENDED
CHECKED Lac APPROVED
CHIEF ENGINEER

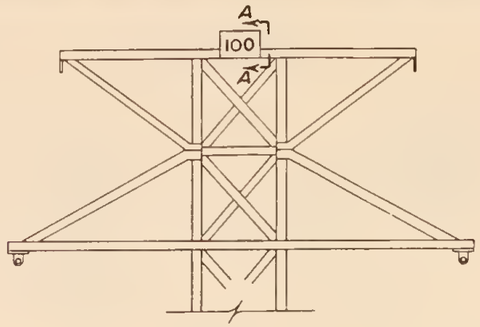
DENVER, COLORADO, MAY 22, 1963 | 40-D-5910

JUNE 24, 1981 | 41 | 9003

25



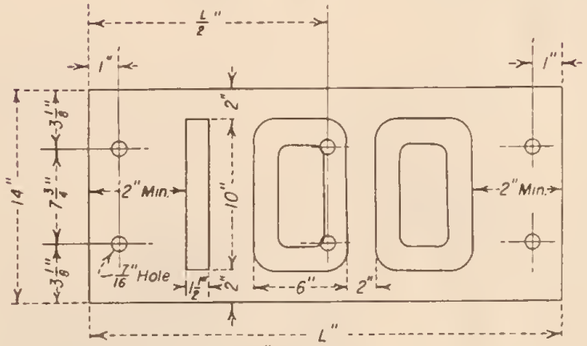




NUMBER SIGN LOCATION AND MOUNTING DETAILS FOR STEEL TOWERS

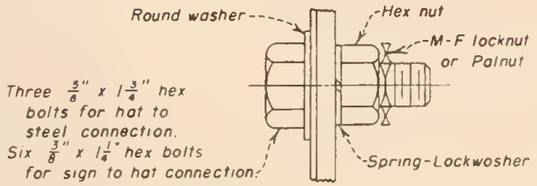
MATERIAL SPECIFICATIONS

1. Signs shall be made of No. 16 U.S. Gauge sheet steel.
2. Finish shall be porcelain enamel. Background color shall be yellow. Figures shall be black.
3. Figures shall be of the "block" type, 10-inches high and 6-inches wide Body lines shall be $1\frac{1}{2}$"-inches wide
4. The porcelain enamel shall be in accordance with the recommended standards for Manufacture of Porcelain Enamel Signs (PEI:S-103) of the Sign Division of the Porcelain Enamel Institute, Inc.
5. All ferrous hardware shall be galvanized.

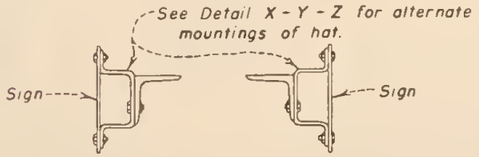


10" for single digit
18" for two digits
26" for three digits

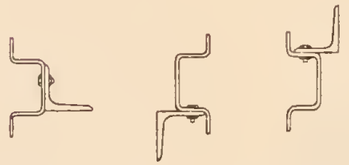
DETAIL A


Round washer
Hex nut
M-F locknut or Palnut
Three 5/8" x 1 3/4" hex bolts for hat to steel connection.
Six 3/8" x 1 1/4" hex bolts for sign to hat connection.
Spring-Lockwasher

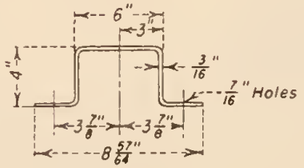
DETAIL B
MOUNTING HARDWARE
See Note 2



SECTION A-A
2 signs per tower



DETAIL X DETAIL Y DETAIL Z
See Detail B for mounting hardware



HAT SECTION
Length of hat shall be same as sign

NOTES

1. First structure of each mile section shall be marked with two metal aerial patrol number signs, one mounted each side of tower as shown above. Location and mounting details are general and may be modified to suit local conditions.
2. Holes for mounting hardware shall be $\frac{1}{16}$" larger than size of bolt used. Holes in signs shall be furnished and fitted with brass eyelets. Longitudinal spacing of all holes in hat sections including those for hat sections to steel connections shall be the same as used for signs.

A	8-6-79 A2-[illegible]	ADDED WAPA DRAWING NUMBER AND REVISED TITLE BLOCK

ALWAYS THINK SAFETY

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
STANDARD DESIGNS

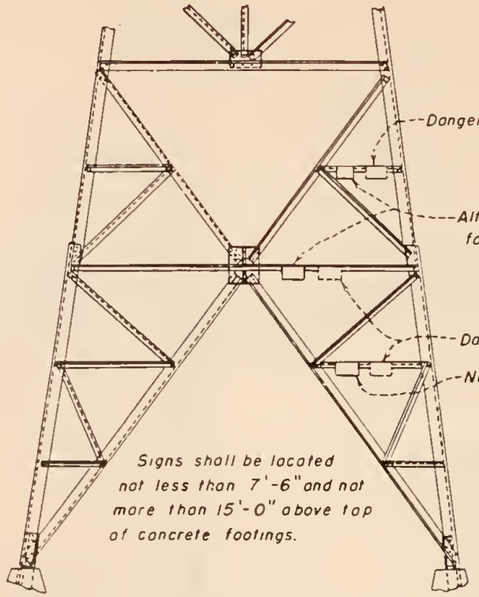
TRANSMISSION LINES

AERIAL PATROL NUMBER SIGNS FOR STEEL TOWERS DETAILS AND LOCATIONS

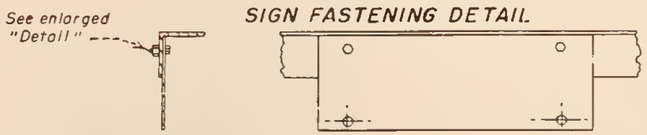
DESIGNED A.D.S. — SUBMITTED [signature]
DRAWN J.M.H. — RECOMMENDED [signature]
CHECKED C.A.C. — APPROVED [signature] CHIEF, ELECTRICAL DESIGN BRANCH

GOLDEN, COLORADO AUGUST 31, 1978 | E40-D-6045

AUGUST 6, 1979 | 41 | 9005


Danger Sign
Alternate locations for Number Sign
Danger Sign
Number Sign
Signs shall be located not less than 7'-6" and not more than 15'-0" above top of concrete footings.

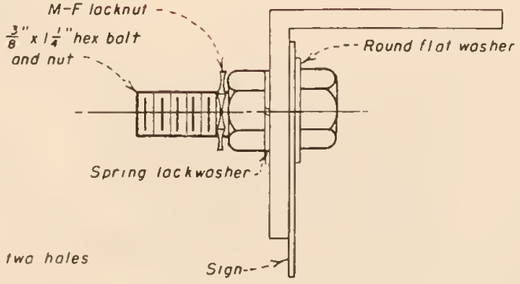
STRUCTURE NUMBER LOCATION



SIGN FASTENING DETAIL.

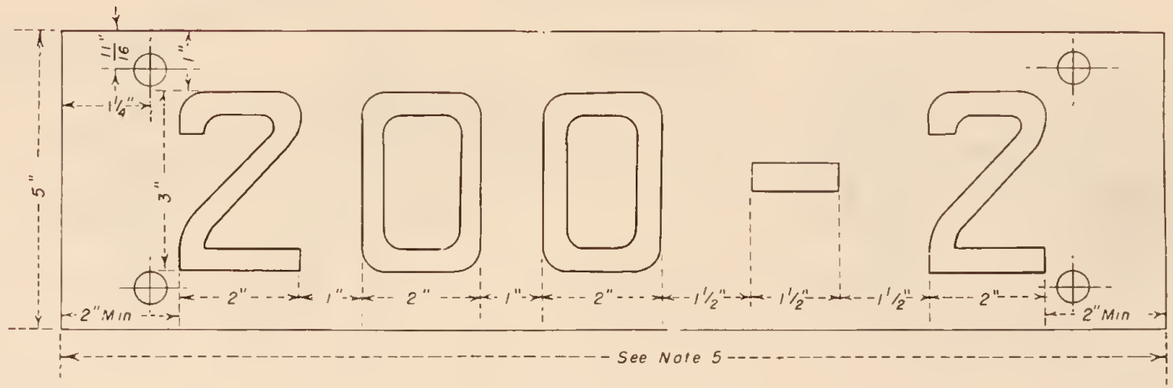
NOTES

1. Signs shall be fastened by means of either the top or the bottom two holes
2. All ferrous hardware shall be galvanized.
3. See Drawing No. E40-D-6288 for location of signs on tubular steel structures.



SIGN MOUNTING HARDWARE

NUMBER SIGN SPECIFICATIONS



NOTES (Cont.)

4. Signs shall be made of No 18 U.S. Gauge sheet steel.
5. Finish shall be porcelain enamel
   Background color shall be yellow Figures shall be black
6. Figures shall be of the "block" type, 3 - inches high and 2 - inches wide Body lines shall be 1/2 - inch wide.
7. Each sign shall have four finished holes large enough to take 3/8 - inch bolts. Holes in signs shall be fitted with brass eyelets.
8. Each sign shall be 5 - inches high, width may vary as follows:
   For four digit signs such as 200-2, width shall be 18 1/2 - inches.
   For four digit signs such as 100-2, width shall be 17 - inches.
   For three digit signs such as 20-2, width shall be 15 1/2 - inches.
   For two digit signs such as 2-2, width shall be 12 1/2 - inches.
9. The porcelain enamel shall be in accordance with the recommended Standards for Manufacture of Porcelain Enamel Signs (PEI-S-103) of the Sign Division of the Porcelain Enamel Institute, Inc.

B	8-10-83 A2-RTE	REMOVED CADMIUM PLATING
A	8-6-79 A2-RTE	ADDED WAPA DRAWING NUMBER AND REVISED TITLE BLOCK.

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION

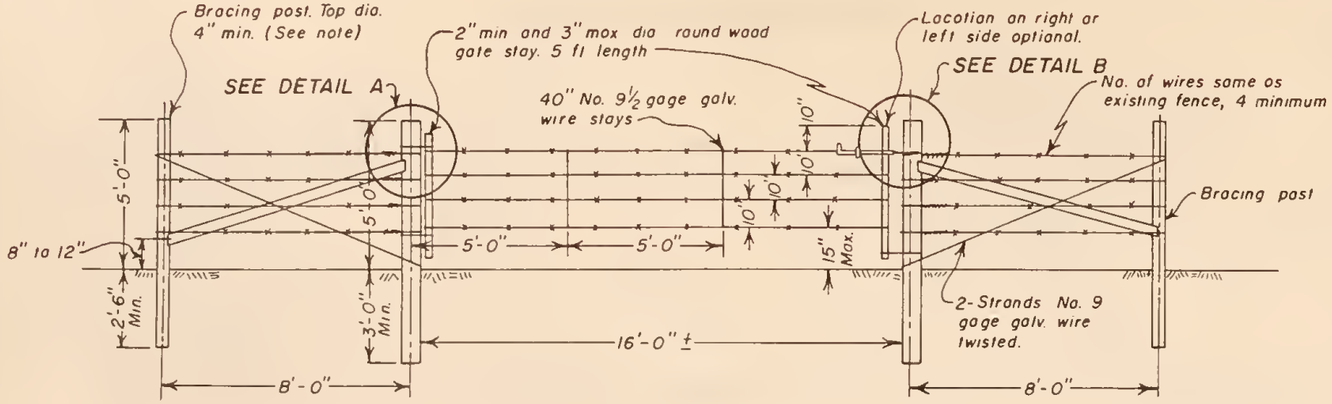
STANDARD DESIGNS
TRANSMISSION LINES
STRUCTURE NUMBER SIGNS
DETAILS AND LOCATION

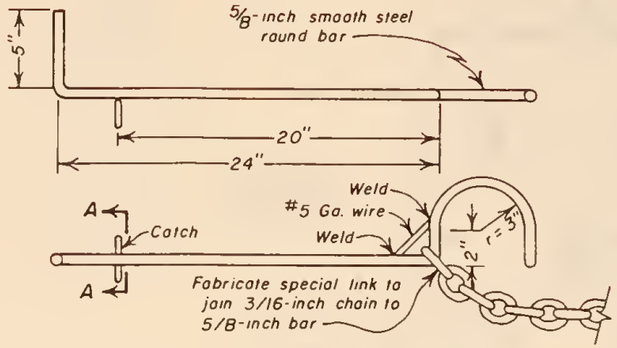
DESIGNED M.C. SUBMITTED
DRAWN E.G.A. RECOMMENDED
CHECKED C.A.C. APPROVED
CHIEF, ELECTRICAL DESIGN BRANCH

GOLDEN, COLORADO JUNE 16, 1979 | E40-D-5762

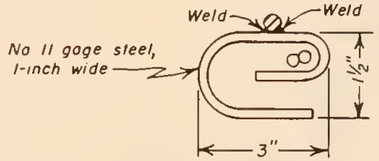
AUGUST 6, 1979 | 41 | 9007

27

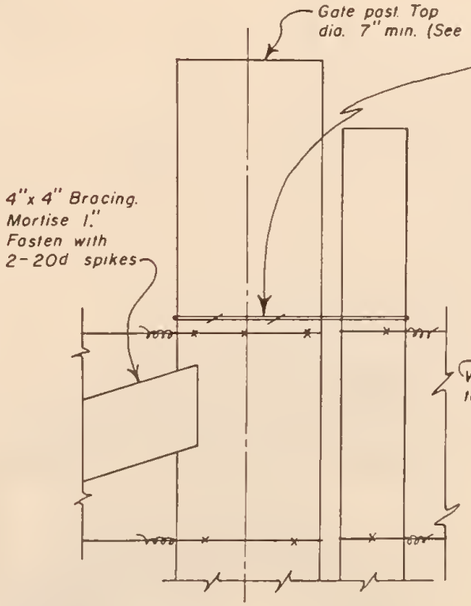

Bracing post. Top dia. 4" min. (See note)
2" min and 3" max dia round wood gate stay. 5 ft length
Location on right or left side optional.
SEE DETAIL A
SEE DETAIL B
40" No. 9½ gage galv. wire stays
No. of wires same as existing fence, 4 minimum
Bracing post
8" to 12"
5'-0"
2'-6" Min.
3'-0" Min.
10"
15" Max.
5'-0"
16'-0" ±
2-Strands No. 9 gage galv. wire twisted.
8'-0"



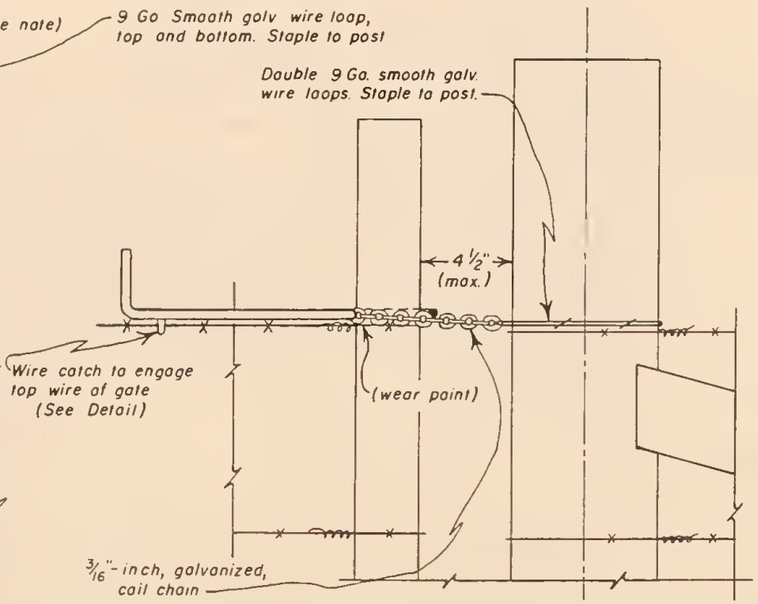
DETAIL OF GATE CLOSER



DETAIL OF CATCH
(Section A-A)


Gate post Top dia. 7" min. (See note)
9 Ga Smooth galv wire loop, top and bottom. Staple to post
4"x 4" Bracing. Mortise 1." Fasten with 2-20d spikes
Wire catch to engage top wire of gate (See Detail)

DETAIL A



DETAIL B

NOTES

Gate posts and bracing posts are included as part of construction of the gate and shall be well-seasoned cedar or a type that has been pressure treated with a preservative. The pressure treated posts shall be Douglas Fir, Western Larch, Lodgepole Pine, or Southern Yellow Pine.

Gate closer shall be galvanized in accordance with A. S. T. M. Designation A-153.

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
BILLINGS CONSTRUCTION – HURON, SOUTH DAKOTA

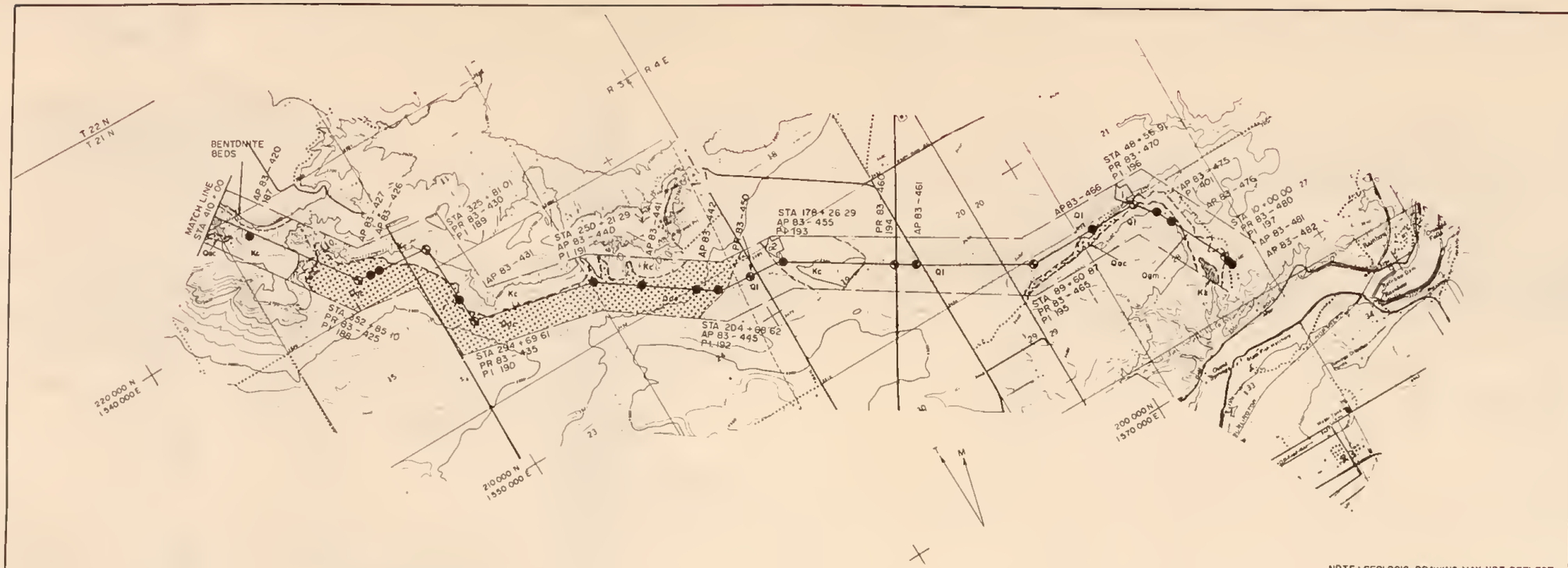
STANDARD DESIGNS

TRANSMISSION LINES

BARBED WIRE GATE FOR OFF RIGHT-OF-WAY ACCESS FENCES

DESIGNED G. O. D. RECOMMENDED
DRAWN M J TSCHETTER APPROVED
CHECKED O A MAGSTADT ASST AREA MGR FOR CONST

NOVEMBER 30, 1982 | 41 | 9020



NOTE: GEOLOGIC DRAWING MAY NOT REFLECT LATEST ALIGNMENT CHANGES FOR LATEST ALIGNMENT SEE APPROPRIATE DESIGN DRAWINGS

LEGEND

GEOLOGIC UNITS

QUATERNARY

- Qac — QUATERNARY ALLUVIAL - COLLUVIAL DEPOSITS - CLAYS WITH SAND AND GRAVEL SOME OCCASIONAL ALLUVIAL DEPOSITS ALSO INCLUDED GENERALLY SHALLOW BEDROCK
- Qgm — QUATERNARY GLACIAL MORAINE - CLAY TILL INCLUDING LENSES OF SAND AND GRAVEL
- Ql — QUATERNARY LAKE DEPOSITS - LAMINATED TO NONLAMINATED HIGH PLASTICITY CLAY AND MINOR AMOUNTS OF SILT
- Qgs — QUATERNARY TERRACE GRAVEL DEPOSITS - WELL ROUNDED AND POORLY GRADED GRAVEL AND COBBLES WITH SILT AND SAND GENERALLY SHALLOW BEDROCK

UPPER CRETACEOUS

- Kc — COLORADO GROUP - DARK GRAY SHALE AND SILTSTONE WITH MANY SANDSTONE UNITS AND BENTONITE LENSES OVERLAIN IN MOST AREAS BY 2 - 3 FEET OF CLAYS WITH SAND AND GRAVEL
- Kk — KOOTENAI FORMATION - SANDSTONE, SHALE, AND MUDSTONE

- MARSHY CONDITIONS - POSSIBLE HIGH GROUND WATER

OTHER SYMBOLS

- LIMIT OF GEOLOGIC MAPPING
- PROPOSED ROUTE OF TRANSMISSION LINE
- AP 83-100 — AUGER HOLE
- PR 83-100 — PENETRATION RESISTANCE HOLE
- 150 — CONTROL POINT ESTABLISHED BY SURVEYORS
- Kc / Qgs — INFERRED GEOLOGIC CONTACT
- D / U — INFERRED FAULT FROM PUBLISHED INFORMATION
- 3 — PHOTO NUMBER AND DIRECTION OF VIEW

SCALE

0 — 2000 — 4000 FEET

DATUM: USGS 7½' AND 15' TOPOGRAPHIC QUADRANGLES

NORTHERN ENGINEERING AND TESTING INC.
BILLINGS, MONTANA

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS - GOLDEN, COLORADO

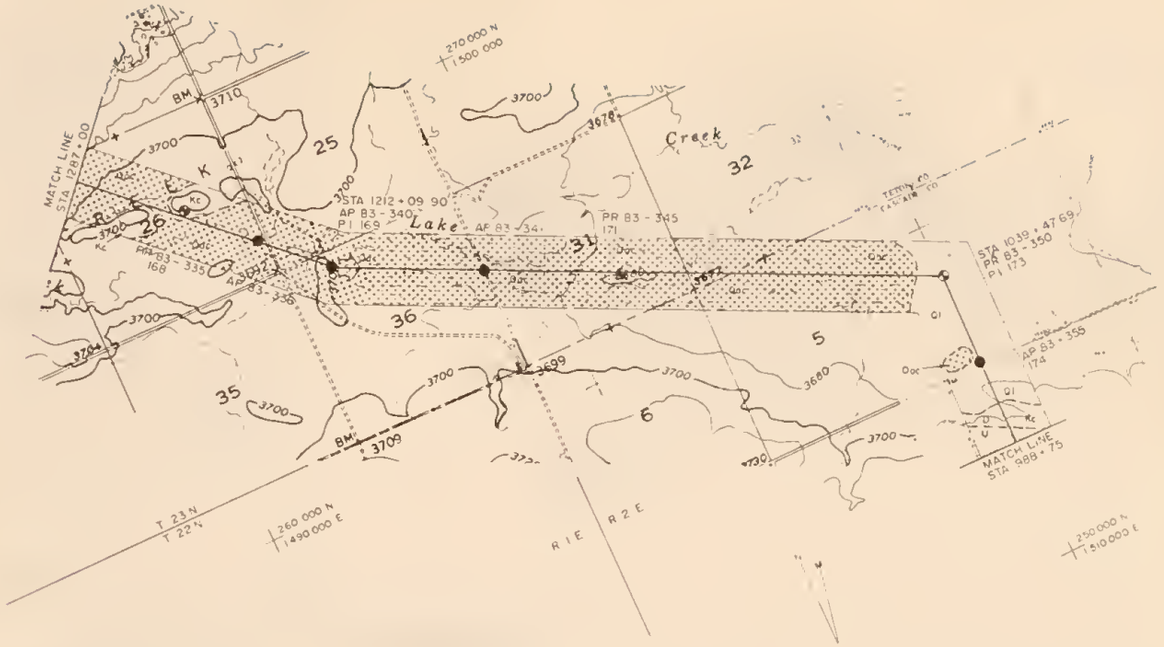
GREAT FALLS — CONRAD
230 KV TRANSMISSION LINE
MONTANA

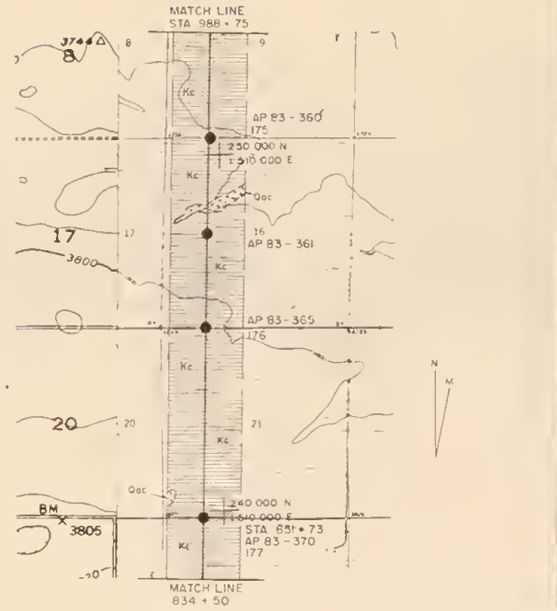
GEOLOGIC & EXPLORATIONS LOCATION MAP
STATION 10+00.00 TO STATION 834+50

GEOLOGY K. Hooding — REVIEWED A. Stilley
DRAWN Debbie Lauck — APPROVED Jan O'Dell
CHECKED A. Stilley — V.P. Northern Engineering & Testing

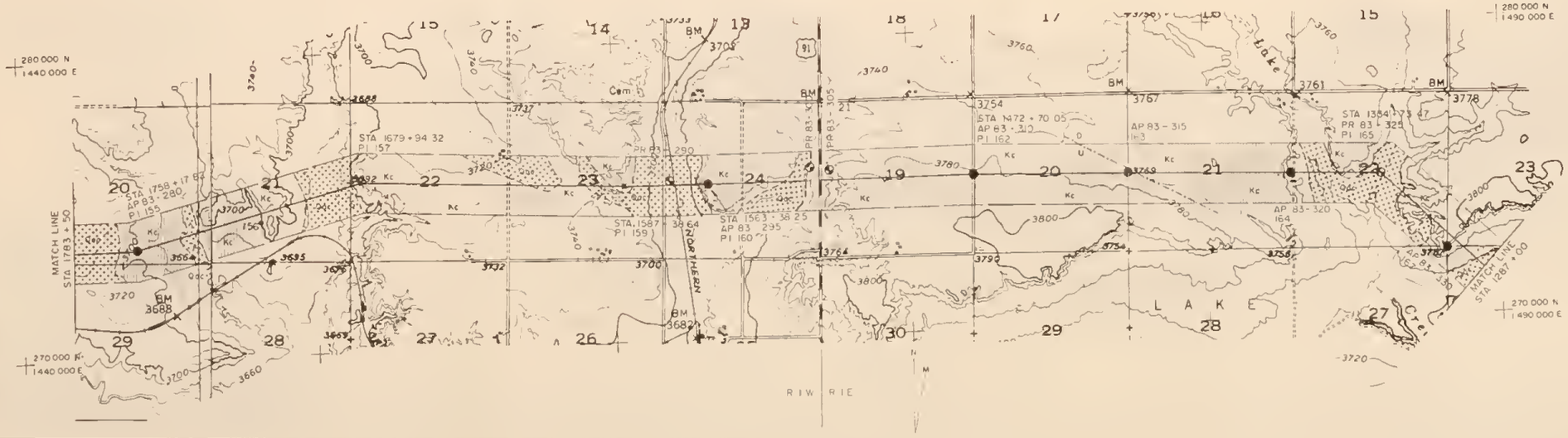
DECEMBER 1983 | GTF-CON | 8000

29





NOTE - GEOLOGIC DRAWING MAY NOT REFLECT LATEST ALIGNMENT CHANGES FOR LATEST ALIGNMENT SEE APPROPRIATE DESIGN DRAWINGS



LEGEND

GEOLOGIC UNITS

QUATERNARY

- Qal — QUATERNARY ALLUVIAL - COLLUVIAL DEPOSITS - CLAYS WITH SAND AND GRAVEL SOME OCCASIONAL ALLUVIAL DEPOSITS ALSO INCLUDED GENERALLY SHALLOW BEDROCK
- Qgm — QUATERNARY GLACIAL MORAINE - CLAY TILL INCLUDING LENSES OF SAND AND GRAVEL
- Ql — QUATERNARY LAKE DEPOSITS - LAMINATED TO NONLAMINATED HIGH PLASTICITY CLAY AND MINOR AMOUNTS OF SILT
- Qgt — QUATERNARY TERRACE GRAVEL DEPOSITS - WELL ROUNDED AND POORLY GRADED GRAVEL AND COBBLES WITH SILT AND SAND GENERALLY SHALLOW BEDROCK

UPPER CRETACEOUS

- Kc — COLORADO GROUP - DARK GRAY SHALE AND SILTSTONE WITH MANY SANDSTONE UNITS AND BENTONITE LENSES OVERLAIN IN MOST AREAS BY 2 - 3 FEET OF CLAYS WITH SAND AND GRAVEL
- Kk — KOOTENAI FORMATION - SANDSTONE, SHALE, AND MUDSTONE

- MARSHY CONDITIONS - POSSIBLE HIGH GROUND WATER

OTHER SYMBOLS

- LIMIT OF GEOLOGIC MAPPING
- PROPOSED ROUTE OF TRANSMISSION LINE
- AP 83 - 100 — AUGER HOLE
- PR 83 - 100 — PENETRATION RESISTANCE HOLE
- 150 — CONTROL POINT ESTABLISHED BY SURVEYORS
- Kc / Qgs — INFERRED GEOLOGIC CONTACT
- cl D — INFERRED FAULT FROM PUBLISHED INFORMATION
- PHOTO NUMBER AND DIRECTION OF VIEW

SCALE

0 2000 4000
FEET

DATUM - USGS 7½' AND 15' TOPOGRAPHIC QUADRANGLES

NORTHERN ENGINEERING AND TESTING INC
BILLINGS, MONTANA

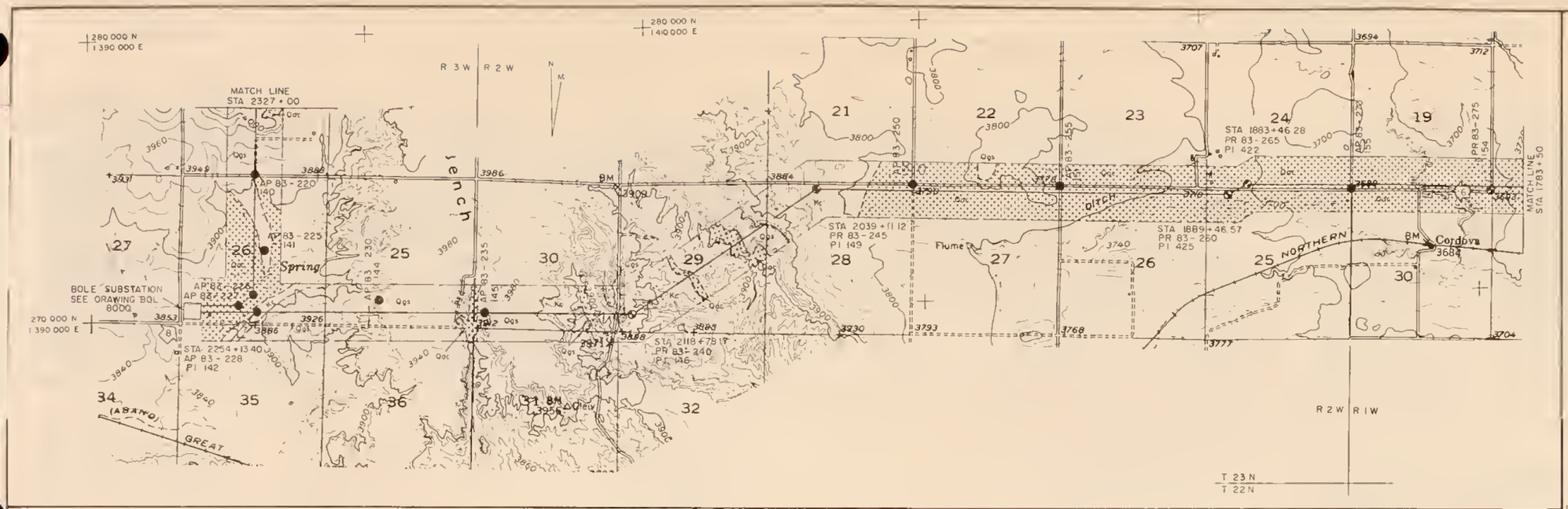
UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS - GOLDEN, COLORADO

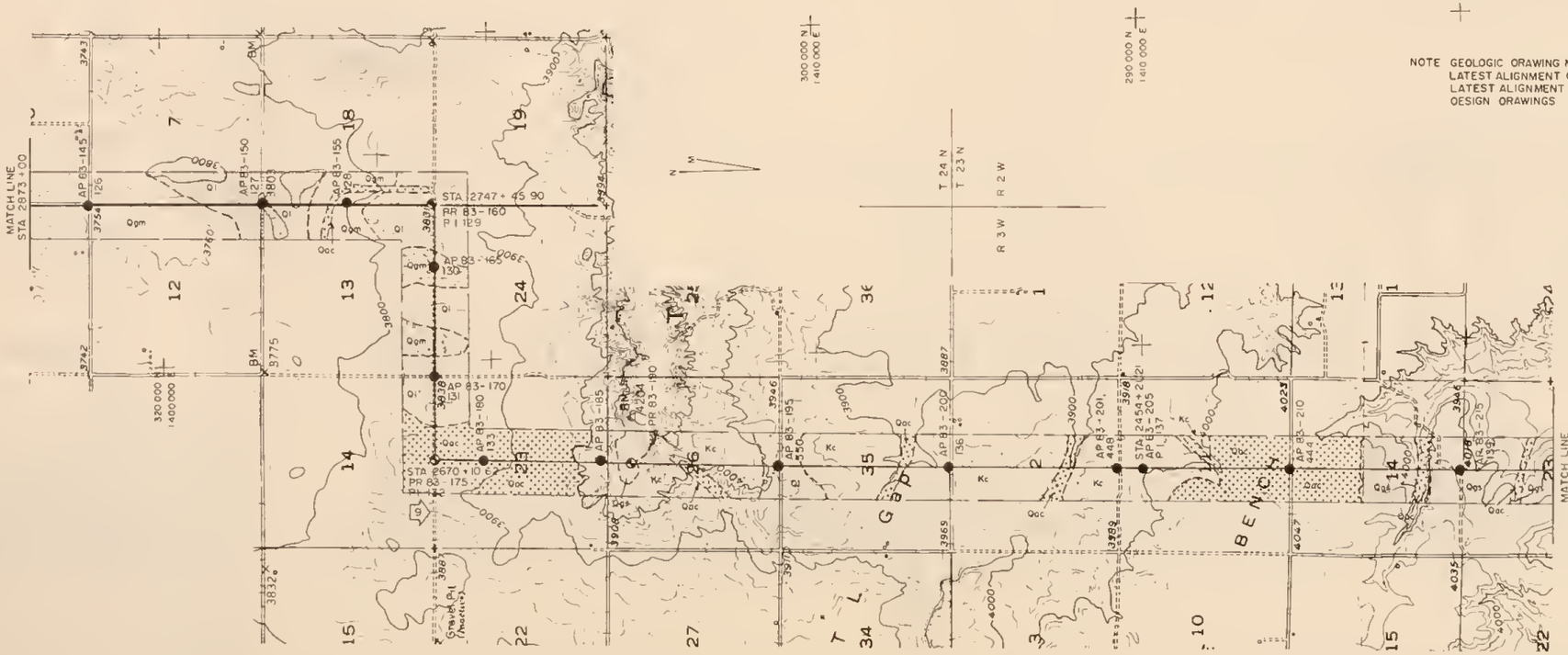
GREAT FALLS - CONRAD
230 KV TRANSMISSION LINE
MONTANA

GEOLOGIC & EXPLORATIONS LOCATION MAP
STATION 834 + 50 TO STATION 1783 + 50

GEOLOGY - [illegible] REVIEWED - A. Stilley
DRAWN - [illegible] APPROVED - [illegible]
CHECKED - A. Stilley — V.P. Northern Engineering & Testing

DECEMBER 1983 | GTF - CON | 8001





NOTE GEOLOGIC DRAWING MAY NOT REFLECT LATEST ALIGNMENT CHANGES FOR LATEST ALIGNMENT SEE APPROPRIATE DESIGN DRAWINGS

LEGEND

GEOLOGIC UNITS

QUATERNARY

- Qac — QUATERNARY ALLUVIAL - COLLUVIAL DEPOSITS - CLAYS WITH SAND AND GRAVEL SOME OCCASIONAL ALLUVIAL DEPOSITS ALSO INCLUDED GENERALLY SHALLOW BEDROCK
- Qgm — QUATERNARY GLACIAL MORAINE - CLAY TILL INCLUDING LENSES OF SAND AND GRAVEL
- Ql — QUATERNARY LAKE DEPOSITS - LAMINATED TO NONLAMINATED HIGH PLASTICITY CLAY AND MINOR AMOUNTS OF SILT
- Qgs — QUATERNARY TERRACE GRAVEL DEPOSITS - WELL ROUNDED AND POORLY GRADED GRAVEL AND COBBLES WITH SILT AND SAND GENERALLY SHALLOW BEDROCK

UPPER CRETACEOUS

- Kc — COLORADO GROUP - DARK-GRAY SHALE AND SILTSTONE WITH MANY SANDSTONE UNITS AND BENTONITE LENSES OVERLAIN IN MOST AREAS BY 2 - 3 FEET OF CLAYS WITH SAND AND GRAVEL
- Kk — KOOTENAI FORMATION - SANDSTONE, SHALE, AND MUDSTONE

MARSHY CONDITIONS - POSSIBLE HIGH GROUND WATER

OTHER SYMBOLS

- LIMIT OF GEOLOGIC MAPPING
- PROPOSED ROUTE OF TRANSMISSION LINE
- AP 83-100 — AUGER HOLE
- PR 83-100 — PENETRATION RESISTANCE HOLE
- 150 — CONTROL POINT ESTABLISHED BY SURVEYORS
- INFERRED GEOLOGIC CONTACT
- INFERRED FAULT FROM PUBLISHED INFORMATION
- PHOTO NUMBER AND DIRECTION OF VIEW

SCALE

0 2000 4000 FEET

DATUM: USGS 7½' AND 15' TOPOGRAPHIC QUADRANGLES

NORTHERN ENGINEERING AND TESTING INC.
BILLINGS, MONTANA

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS - GOLDEN, COLORADO

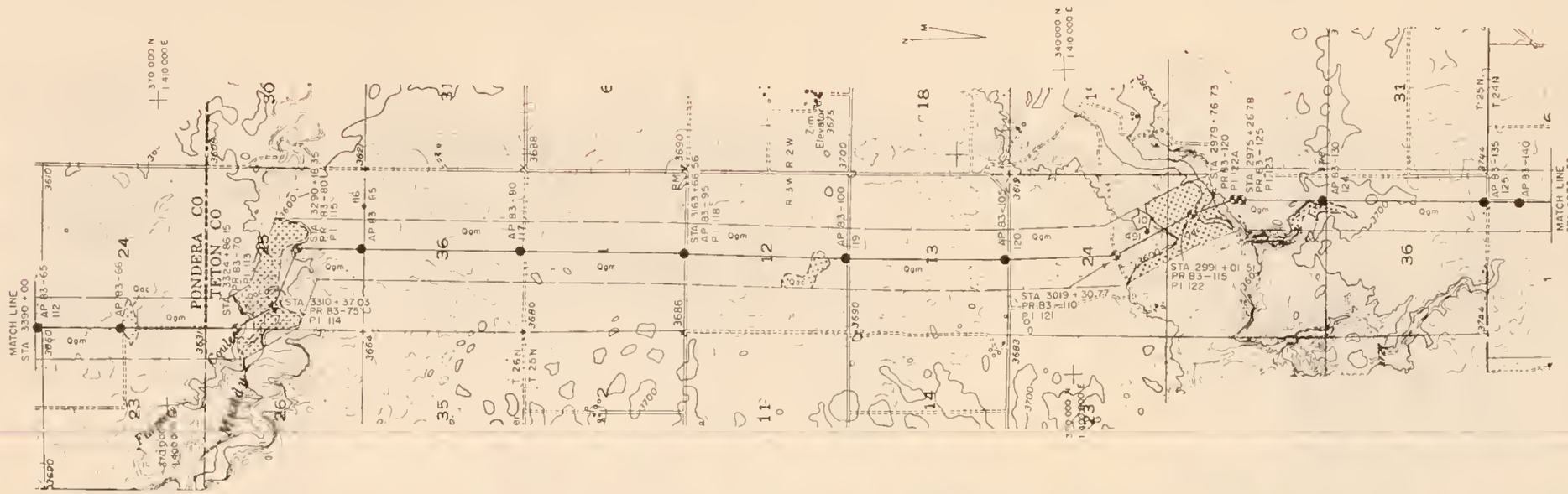
GREAT FALLS — CONRAD
230 KV TRANSMISSION LINE
MONTANA

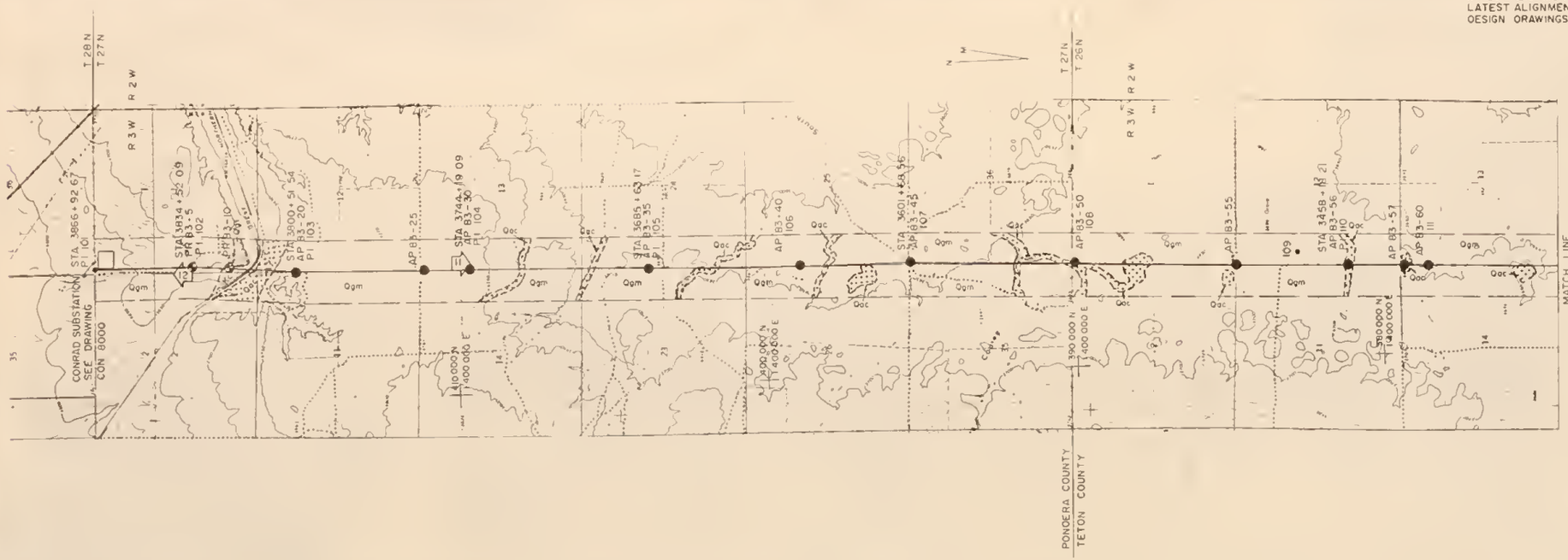
GEOLOGIC & EXPLORATIONS LOCATION MAP
STATION 1783+50 TO STATION 2873+00

GEOLOGY by KBOOMS — REVIEWED A. Stilley
DRAWN Laska-Lovick — APPROVED Jon B. O'Dell
CHECKED A. Stilley — V.P. Northern Engineering & Testing

DECEMBER 1983 | GTF-CON | 8002

31





NOTE: GEOLOGIC ORAWING MAY NOT REFLECT LATEST ALIGNMENT CHANGES FOR LATEST ALIGNMENT SEE APPROPRIATE OESIGN ORAWINGS

LEGEND

GEOLOGIC UNITS

QUATERNARY

- Qac — QUATERNARY ALLUVIAL - COLLUVIAL OEPOSITS - CLAYS WITH SANO ANO GRAVEL SOME OCCASIONAL ALLUVIAL OEPOSITS ALSO INCLUOEO GENERALLY SHALLOW BEOROCK
- Qgm — QUATERNARY GLACIAL MORAINE - CLAY TILL INCLUOING LENSES OF SANO ANO GRAVEL
- Ql — QUATERNARY LAKE DEPOSITS - LAMINATEO TO NONLAMINATEO HIGH PLASTICITY CLAY ANO MINOR AMOUNTS OF SILT
- Qgt — QUATERNARY TERRACE GRAVEL OEPOSITS - WELL ROUNDEO AND POORLY GRAOEO GRAVEL AND COBBLES WITH SILT ANO SANO GENERALLY SHALLOW BEOROCK

UPPER CRETACEOUS

- Kc — COLORADO GROUP - OARK GRAY SHALE ANO SILTSTONE WITH MANY SANDSTONE UNITS ANO BENTONITE LENSES OVERLAIN IN MOST AREAS BY 2 - 3 FEET OF CLAYS WITH SANO AND GRAVEL
- Kk — KOOTENAI FORMATION - SANDSTONE, SHALE, ANO MUOSTONE

- MARSHY CONDITIONS - POSSIBLE HIGH GROUNO WATER

OTHER SYMBOLS

- LIMIT OF GEOLOGIC MAPPING
- PROPOSEO ROUTE OF TRANSMISSION LINE
- AP 83-100 — AUGER HOLE
- PR 83-100 — PENETRATION RESISTANCE HOLE
- 50 — CONTROL POINT ESTABLISHEO BY SURVEYORS
- Kc / Qgt — INFERREO GEOLOGIC CONTACT
- INFERREO FAULT FROM PUBLISHED INFORMATION
- PHOTO NUMBER ANO OIRECTION OF VIEW

SCALE

0 2000 4000
FEET

OATUM: USGS 7½' AND 15' TOPOGRAPHIC QUAORANGLES

NORTHERN ENGINEERING AND TESTING INC.
BILLINGS, MONTANA

UNITED STATES DEPARTMENT OF ENERGY
WESTERN AREA POWER ADMINISTRATION
HEADQUARTERS - GOLDEN, COLORADO

GREAT FALLS – CONRAD
230 KV TRANSMISSION LINE
MONTANA

GEOLOGIC & EXPLORATIONS LOCATION MAP
STATION 2873+00 TO STATION 3866+92.67

GEOLOGY R. HEDDING — REVIEWED A. Stilley
DRAWN Debbie Blank — APPROVED Dan D. Dahl
CHECKED A. Stilley — for Northern Engineering & Testing

DECEMBER 1983	GTF-CON	8003

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

32

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana

Hole No: PR 83-5 — Coordinates N: 418,547 — E: 1,404,640 — Ground Elevation: 3704

Depth and Elev of Water Level: Not Encountered — Location: Station 3834+52.09, 40' right — Total Depth: 20.0 feet

*Date Measured: 8/30/83 — Date Begun: 8/30/83 — Finished: 8/30/83 — Logged by: W. Henning — Reviewed by: A. Stilley

NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By: Northern Engineering and Testing, Inc.

Drill Equipment: Mobile B-50 Rotary, Truck-mounted

Driller: B. Neff

Method: Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below.

Drive Sample Intervals, Feet:
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0

Progress Report: 0-20.0' 8/30/83. After augers were removed, hole remained open. Hard drilling. Drilled at 40' east of PI 102

Hole Backfilled 8/30/83

CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT)	GRAPHIC LOG
86	20	12	SPT	0.5	
86	31	12	SPT	10	CL
93	44	13	SPT		
93	74	12	SPT	20.0	

PENETRATION RESISTANCE — Blows per Foot — Weight of Hammer: 140 lb — Height of Drop: 30 in.

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 5% gravel, 20% fine sand, 50% medium plasticity fines, 25% organic material, Maximum Size 2" angular to subrounded, Color Brown, Moisture slightly moist.

0.5'-20.0' SILTY CLAY - about 10% gravel, 20% fine to medium sand, 70% medium plasticity fines, Maximum Size 3" rounded to subangular, Color Brown, Moisture slightly moist, very stiff to hard glacial till, (CL).

EXPLANATION

BLOWS/FOOT: Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated, thus, 50/.4 indicates 0.4 foot penetrated with 50 blows, extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION: Describe soil type with emphasis on in-place condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1 1/4 inch, firm, moist, gray, uncemented (SP)

PENETRATION RESISTANCE: Plot, as shown at right. Actual values ●, extrapolated values at 50, open circle with extrapolated value 125○

FEATURE: Great Falls-Conrad 230 KV Transmission Line — STATE: Montana — HOLE NO: PR 83-5 — DWG NO: GTF-CON 8004

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

33

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana

Hole No: PR 83-10 — Coordinates N: 417,255 — E: 1,404,425 — Ground Elevation: 3678

Depth and Elev of Water Level: Not Encountered — Location: Station 3821+47, 50' left — Total Depth: 20.9 feet

*Date Measured: 8/30/83 — Date Begun: 8/30/83 — Finished: 8/30/83 — Logged by: W. Henning — Reviewed by: A. Stilley

NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By: Northern Engineering and Testing, Inc.

Drill Equipment: Mobile B-50 Rotary, Truck-mounted

Driller: B. Neff

Method: Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below.

Drive Sample Intervals, Feet:
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.9

Progress Report: 0-20.9' 8/30/83. After augers were removed, hole remained open. Moderate to hard drilling.

Hole Backfilled 8/30/83

CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT)	GRAPHIC LOG
93	20	6	SPT	0.5	
93	60	10	SPT	2.0	CL
0	50/0.1	--	SPT	20	
93	50/.4	9	SPT	20.9	

PENETRATION RESISTANCE — Blows per Foot — Weight of Hammer: 140 lb — Height of Drop: 30 in.

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 20% fine sand, 60% low plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture dry.

0.5'-2.0' SANDY GRAVEL - about 70% gravel, 25% fine to medium sand, 5% non-plastic fines, Maximum Size 2" angular to subrounded, Color Brown, Moisture dry, medium dense, slope wash, (GP).

2.0'-20.9' SHALE CLAYSTONE - soft shale, thinly bedded, fractured, salts, some selenite, Colorado Group; recovered as about 5% sand, 95% medium to high plasticity fines, Maximum Size fine sand, Color Gray, Moisture dry.

EXPLANATION

BLOWS/FOOT: Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated, thus, 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION: Describe soil type, with emphasis on in-place condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1 1/4 inch, firm, moist, gray, uncemented (SP)

PENETRATION RESISTANCE: Plot, as shown at right. Actual values ●, extrapolated values at 50, open circle with extrapolated value 125○

FEATURE: Great Falls-Conrad 230 KV Transmission Line — STATE: Montana — HOLE NO: PR 83-10 — DWG NO: GTF-CON 8005

34

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No: AP 83-20

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana

Station: 3800+51.54, 5' left — Coordinates N: 415,165 E: 1,404,269 — Ground Elevation: 3780 — Approx. Dimensions: 9" Auger

Date & Depth to Water: Not Encountered — Method of Excavation: Mobile B-50 — Date: 8/31/83 — Logged by: W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)
		0.5		
			SPT N = 37	9
CL			SPT N = 65	10
			SPT N = 35	11
		20.0	SPT N = 43	12

CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—"UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)

0.0' - 0.5' TOPSOIL - about 5% gravel, 20% fine sand, 50% medium plasticity fines, 25% organic material, Maximum Size 2", Color Brown, Moisture dry

0.5'-20.0' SILTY CLAY - about 10% gravel, 20% medium to coarse sand, 70% medium plasticity fines, Maximum Size 3" subangular to subrounded, Color Brown, Moisture slightly moist, very stiff to hard, glacial till, (CL).

PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
	0	0

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.0'
Hole Backfilled 8/31/83 - Drilled at PI 103.

Moderate to Hard Drilling

NOTE: Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO: AP 83-20 — DWG NO: GTF-CON 8006

35

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No: AP 83-25

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana

Station: 3759+19.09, centerline — Coordinates N: 411,036 E: 1,404,121 — Ground Elevation: 3776 — Approx. Dimensions: 9" Auger

Date & Depth to Water: Not Encountered — Method of Excavation: Mobile B-50 — Date: 8/31/83 — Logged by: W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)
		0.5		
			SPT N = 53	7
CL			SPT N = 36	14
			SPT N = 34	14
		20.0	SPT N = 25	14

CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—"UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)

0.0' - 0.5' TOPSOIL - about 10% gravel, 20% fine sand, 60% medium plasticity fines, 10% organic material, Maximum Size 2", Color Brown, Moisture dry.

0.5' - 20.0' SILTY CLAY WITH COBBLES - about 10% fine to coarse gravel, 20% fine to medium sand, 70% medium plasticity fines, Maximum Size 5" rounded to subangular, Color Brown, Moisture slightly moist, hard, salts, carbon detritus, oxides, glacial till, (CL).

PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
	5	0

REMARKS: Drilled by Northern Engineering & Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After auger removed, hole remained open.
Required Depth = 20.0'
Hole Backfilled 8/31/83 - Drilled 1500' north of PI 104

Moderate to Hard Drilling

NOTE: Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO: AP 83-25 — DWG NO: GTF-CON 8007

36

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-30

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 3744+14.09, centerline — Coordinates N 409,532 ; E 1,404,065 — Ground Elevation 3769 — Approx Dimensions 18" Auger
Date & Depth to Water Not Encountered — Method of Excavation Power Pole Auger — Date 9/26/83 — Logged By P. O'Rourke

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	UNIFIED SOIL CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL		0.4	S. Sack	7	0.0' - 0.4' TOPSOIL - about 40% fine to medium sand, 50% non-plastic fines, 10% organic material, Maximum Size medium sand, Color Brown, Moisture dry, loose.			
			S. Sack	8	0.4' - 11.0' SILTY CLAY WITH GRAVEL - about 5% cobbles, 10% gravel, 20% fine sand, 65% medium plasticity fines, Maximum Size 4" angular to subrounded, Color Brown, Moisture moist, stiff to hard, scattered cobbles, glacial till, (CL).		5	0
			S. Sack	7				
		11.0			Auger refusal at 11.0' in cobbles.			

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger.
After auger removed, hole stayed open
Auger refusal at 11.0'.
Hole Backfilled 9/26/83 - Drilled at PI 104

NOTE: Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-30 — DWG NO GTF-CON 8008

37

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-35

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 3685+63.17, 12' right — Coordinates N 403,685 ; E 1,403,888 — Ground Elevation 3654 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 8/31/83 — Logged By W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	UNIFIED SOIL CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL		0.5	SPT N = 27	10	0.0' - 0.5' TOPSOIL - about 10% fine gravel, 30% fine to medium sand, 50% low plasticity fines, 10% organic material, Maximum Size 2", Color Brown, Moisture dry.			
			SPT N = 22	18	0.5' - 20.0' SILTY CLAY WITH COBBLES - about 10% gravel, 20% medium to coarse sand, 70% medium plasticity fines, Maximum Size 5" rounded to subangular, Color Brown, Moisture slightly moist, very stiff to hard, carbon detritus, salts, oxides, glacial till, (CL).		5	0
			SPT N = 19	17				
		20.0	SPT N = 20	17				

REMARKS: Drilled by Northern Engineering & Testing, Inc.
Mobile Drill, Model B-50 with 9" hollowstem augers used.
After auger removed, hole remained open.
Required Depth = 20.0'
Hole Backfilled 8/31/83 - Drilled 12' east of PI 105.

Moderate to Hard Drilling

NOTE: Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-35 — DWG NO GTF-CON 8009

38

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-40

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 3636+45.32, 10' left — Coordinates N 398,771 ; E 1,403,726 — Ground Elevation 3637 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 8/31/83 — Logged By W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	UNIFIED SOIL CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CH		0.5	SPT N = 16	23	0.0' - 0.5' TOPSOIL - about 5% gravel, 20% fine to medium sand, 65% medium plasticity fines, 10% organic material, Maximum Size 1" rounded, Color Brown, Moisture dry		0	0
		6.0	SPT N = 15	14	0.5' - 6.0' FAT CLAY - 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture moist, very stiff, slope wash, (CH)			
CL			SPT N = 64	15	6.0' - 20.0' SILTY CLAY - about 10 gravel, 20% fine to medium sand, 70% medium plasticity fines, Maximum Size 3" rounded to subangular, Color Brown, Moisture moist, stiff to very stiff, salts, carbon detritus, oxides, glacial till, (CL).		0	0
		20.0	SPT N = 27	13				

REMARKS: Drilled by Northern Engineering & Testing, Inc.
Mobile Drill, Mobel B-50, with 9" hollowstem augers used
After auger removed, hole remained open
Required Depth = 20.0'
Hole Backfilled 8/31/83 - Drilled 10' west of PI 106.

Moderate to Hard Drilling

NOTE: Unless otherwise indicated % by volume of 1-5" & plus 5" material is estimated

HOLE NO AP 83-40 — DWG NO GTF-CON 8010

39

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-45

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 3601+68.56, 5' right — Coordinates N 395,296 ; E 1,403,642 — Ground Elevation 3640 — Approx Dimensions 18" Auger
Date & Depth to Water Not Encountered — Method of Excavation Power Pole Auger — Date 9/26/83 — Logged By P. O'Rourke

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	UNIFIED SOIL CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL		0.4	S. Sack	9	0.0' - 0.4' TOPSOIL - about 5% gravel, 25% fine sand, 60% low plasticity fines, 10% organic material, Maximum Size 1" subangular to subrounded, Color Brown, Moisture dry, loose		10	0
			S. Sack	14	0.4' - 20.0' SILTY CLAY WITH COBBLES AND GRAVEL - about 10% cobbles, 10% coarse gravel, 20% fine sand, 60% medium plasticity fines, Maximum Size 4" subangular to subrounded, Color Brown, Moisture slightly moist to moist, very stiff to hard, scattered cobbles between 3.5' and 7.0', glacial till, (CL)			
			S. Sack	16				
		20.0	S. Sack	18				

REMARKS: Drilled by Northern Engineering and Testing, Inc
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger
After auger removed, hole stayed open.
Required Depth = 20.0', 9/26/83.
Hole Backfilled 9/26/83 - Drilled at PI 107

NOTE: Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-45 — DWG NO GTF-CON 8011

40

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-50

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 3548+56, 14' right — Coordinates N 389,990 ; E 1,403,396 — Ground Elevation 3666 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 8/31/83 — Logged By W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	UNIFIED SOIL CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CH		0.5	SPT N = 12	19	0.0' - 0.5' TOPSOIL - about 5% fine gravel, 20% fine to medium sand, 60% medium plasticity fines, 15% organic material, Maximum Size 1", Color Brown, Moisture dry.		0	0
		6.5	SPT N = 17	17	0.5' - 6.5' FAT CLAY - about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, stiff to very stiff, salts, oxides, slope wash (CH).			
CL			SPT N = 17	15	6.5' - 20.0' SILTY CLAY - about 10% gravel, 20% fine to medium sand, 70% medium plasticity fines, Maximum Size 3" rounded to subangular, Color Brown, Moisture moist, stiff to very stiff, salts and oxide concentrations, glacial till, (CL).		0	0
		20.0	SPT N = 17	16				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After auger removed, hole remained open
Required Depth = 20.0'
Hole Backfilled 8/31/83 - Drilled 20' south of PI 108

Moderate to Hard Drilling

NOTE: Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-50 — DWG NO GTF-CON 8012

41

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-55

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 3495+58, centerline — Coordinates N 384,700 ; E 1,403,128 — Ground Elevation 3687 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 8/31/83 — Logged By W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	UNIFIED SOIL CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL		0.5	SPT N = 32	8	0.0' - 0.5' TOPSOIL - about 5% fine gravel, 20% fine sand, 60% medium plasticity fines, 15% organic material, Maximum Size 1", Color Brown, Moisture slightly moist.			
			SPT N = 18	12	0.5' - 20.0' SILTY CLAY - about 10% gravel, 20% fine to medium sand, 70% medium plasticity fines, Maximum Size 5", Color Brown, Moisture slightly moist, hard to very stiff, salts, oxides, glacial till, (CL).		2	0
			SPT N = 27	12				
		20.0	SPT N = 22	12				

REMARKS: Drilled by Northern Engineering & Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After auger removed, hole remained open.
Required Depth = 20.0'
Hole Backfilled 8/31/83 - Drilled southwest corner of Section 1, T26N, R3W

Moderate to Easy Drilling

NOTE: Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-55 — DWG NO GTF-CON 8013

42

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-56

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 3458+13.21, centerline Coordinates N 380,960 E 1,402,949 Ground Elevation 3667 Approx Dimensions 18" Auger
Date & Depth to Water 12.0' 9/27/83 Method of Excavation Power Pole Auger Date 9/27/83 Logged by D. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	UNIFIED SOIL CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL		0.4	S. Sack	24	0.0' - 0.4' TOPSOIL - about 5% fine sand, 85% low plasticity fines, 10% organic material, Maximum Size fine sand, Color Brown, Moisture dry to slightly moist, stiff to very stiff			
CH		3.5	S. Sack	21	0.4' - 3.5' SILTY CLAY WITH GRAVEL - about 10% gravel, 10% sand, 80% medium plasticity fines, Maximum Size 1" subrounded, Color Brown, Moisture slightly moist to moist, very stiff, (CL).		0	0
		8.0	S. Sack	21	3.5' - 8.0' FAT CLAY - about 5% medium sand, 95% high plasticity fines, Maximum Size medium sand, Color Brown, Moisture very moist, very stiff to hard, (CH).		0	0
CL		12.0	S. Sack	21	8.0' - 20.0' SILTY CLAY WITH GRAVEL - about 10% sand, 15% gravel, 75% medium plasticity fines, Maximum Size 2½" subrounded, Color Brown, Moisture moist to saturated, very stiff to hard, glacial till, (CL).		0	0
		20.0	S. Sack	18				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger
After auger removed, hole stayed open.
Required Depth = 20.0', 9/27/83
Hole Backfilled 9/27/83 - Drilled at PI 110
20.0' of 1½" perforated pvc pipe installed as observation well.

NOTE Unless otherwise indicated % by volume of 3-5' & plus 5" material is estimated

HOLE NO AP 83-56 DWG NO GTF-CON 8014

44

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-60

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 3432+73, 40' left Coordinates N 378,424 E 1,402,808 Ground Elevation 3653 Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 9/01/83 Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	UNIFIED SOIL CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL		0.5	SPT N = 38	8	0.0' - 0.5' TOPSOIL - about 10% gravel, 20% fine sand, 50% medium plasticity fines, 20% organic material, Maximum Size 1", Color Brown, Moisture dry.			
			SPT N = 25	14	0.5' - 20.0' SILTY CLAY - about 10% gravel, 20% fine to medium sand, 70% medium plasticity fines, Maximum Size 3" rounded to subangular, Color Brown, Moisture slightly moist, hard, salts, oxides, some fat clay lenses, glacial till, (CL).		0	0
			SPT N = 21	12				
		20.0	SPT N = 26	11				

REMARKS Drilled by Northern Engineering & Testing, Inc
Mobile Drill, Model B-50, with 9" hollowstem augers used
After auger removed, hole remained open.
Required Depth = 20.0'
Hole Backfilled 9/01/83 - Drilled 10' west of PI 111.
Moderate to Hard Drilling

NOTE Unless otherwise indicated % by volume of 3-5' & plus 5" material is estimated

HOLE NO AP 83-60 DWG NO GTF-CON 8016

46

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-66

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 3362+34, centerline Coordinates N 371,390 E 1,402,569 Ground Elevation 3647 Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 9/01/83 Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	UNIFIED SOIL CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CH		0.5	SPT N = 11	8	0.0' - 0.5' TOPSOIL - about 10% gravel, 20% fine sand, 50% medium plasticity fines, 20% organic material, Maximum Size 1", Color Brown, Moisture dry		0	0
		6.0	SPT N = 30	14	0.5' - 6.0' FAT CLAY - about 20% fine sand, 80% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist, firm, alluvial, (CH)			
CL			SPT N = 20	19	6.0' - 20.0' SILTY CLAY - about 10% gravel, 20' fine to medium sand, 70' medium plasticity fines, Maximum Size 3" rounded to subangular, Color Brown, Moisture moist, hard to very stiff, salts, oxides, glacial till, (CL)		0	0
		20.0	SPT N = 24	16				

REMARKS Drilled by Northern Engineering & Testing, Inc
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After auger removed, hole remained open.
Required Depth = 20.0'
Hole Backfilled 9/01/83 - Drilled 1/2 mile north of Section Line, Moderate Drilling

NOTE Unless otherwise indicated % by volume of 3-5' & plus 5" material is estimated Pondera-Teton County Line

HOLE NO AP 83-66 DWG NO GTF-CON 8018

43

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-57

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 3441+72, centerline Coordinates N 379,320 E 1,402,883 Ground Elevation 3653 Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 8/31/83 Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	UNIFIED SOIL CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CH		0.5	SPT N = 16	10	0.0' - 0.5' TOPSOIL - about 5% gravel, 20% fine sand, 60% medium plasticity fines, 15% organic material, Maximum Size 1/2", Color Brown, Moisture dry.			
			SPT N = 6	21	0.5' - 11.0' FAT CLAY - about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist, very stiff, alluvial, (CH).		0	0
		11.0	SPT N = 10	29	11.0' - 16.0' SILTY CLAY - about 10% fine sand, 90% medium plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, soft, alluvial, (CL).			
CL			SPT N = 27	16	16.0' - 20.0' SILTY CLAY - about 10% gravel, 20% fine sand, 70% medium plasticity fines, Maximum Size 2" rounded to subangular, Color Brown, Moisture moist, very stiff, salts, oxides, carbon detritus, glacial till, (CL)		0	0
		20.0						

REMARKS Drilled by Northern Engineering & Testing, Inc.
Mobile Drill, Model B-50, with hollowstem augers used.
After auger removed, hole remained open.
Required Depth = 20.0
Hole Backfilled 8/31/83 - Drilled 800' north of PI 111 centerline.
Moderate to Difficult Drilling

NOTE Unless otherwise indicated % by volume of 3-5' & plus 5" material is estimated

HOLE NO AP 83-57 DWG NO GTF-CON 8015

45

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-65

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 3389+09, 5' left Coordinates N 374,063 E 1,402,670 Ground Elevation 3648 Approx Dimensions 18" Auger
Date & Depth to Water Not Encountered Method of Excavation Power Pole Auger Date 9/27/83 Logged by O. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	UNIFIED SOIL CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL		0.4	S. Sack	24	0.0' - 0.4' TOPSOIL - about 10% sand, 70% low plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture dry to slightly moist, stiff.			
			S. Sack	27	0.4' - 20.0' SILTY CLAY WITH GRAVEL - about 5% cobbles, 15% gravel, 15% sand, 65% medium plasticity fines, Maximum Size 4" subrounded, Color Brown, Moisture slightly moist to very moist, very stiff, glacial till, (CL)		5	0
			S. Sack	17				
			S. Sack	17				
		20.0						

REMARKS Drilled by Northern Engineering and Testing, Inc.
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger
After auger removed, hole stayed open.
Required Depth = 20.0', 9/27/83
Hole Backfilled 9/27/83 - Drilled 5' east of PI 112.

NOTE Unless otherwise indicated % by volume of 3-5' & plus 5" material is estimated

HOLE NO AP 83-65 DWG NO GTF-CON 8017

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

47

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Hole No PR 83-70 — Coordinates N 367,646 — E 1,402,410 — Ground Elevation 3626

Depth and Elev of Water Level* Not Encountered — Location Station 3324+86.15, 10' left — Total Depth 20.0 feet

*Date Measured 9/01/83 — Date Begun 9/01/83 — Finished 9/01/83 — Logged by W. Henning — Reviewed by A. Stilley

NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By: Northern Engineering and Testing, Inc.

Drill Equipment: Mobile B-50 Rotary, Truck-mounted

Driller: B. Neff

Method: Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below

Drive Sample Intervals, feet:
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0

Progress Report: 0-20.0' 9/01/83 After augers were removed, hole remained open. Moderate to hard drilling. Drilled 10' west of PI 113.

Hole Backfilled: 9/01/83

CORE RECOVERY*	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT.)	GRAPHIC LOG
86	19	6	SPT	0.5	
86	25	9	SPT		CL
93	21	11	SPT	10	
93	20	13	SPT	20.0	

PENETRATION RESISTANCE — Blows per Foot — Weight of Hammer 140 lb — Height of Drop 30 in.

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 5% gravel, 20% fine sand, 50% medium plasticity fines, 25% organic material, Maximum Size 1", Color Brown, Moisture dry.

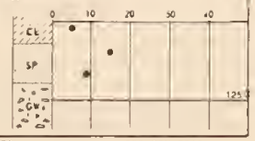
0.5'-20.0' SILTY CLAY WITH COBBLES about 10% gravel and cobbles, 20% fine to coarse sand, 70% medium plasticity fines, Maximum Size 5" rounded to subangular, Color Brown, Moisture slightly moist, very stiff to hard, salts, oxides, glacial till, (CL).

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated, thus, 50/.4 indicates 0.4 foot penetrated with 50 blows, extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type, with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot, as shown at right. Actual values ●, extrapolated values at 50, open circle with extrapolated value 125○



FEATURE Great Falls-Conrad 230 KV Transmission Line — STATE Montana — HOLE NO PR 83-70 — DWG NO GTF-CON 8019

48

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Hole No. PR 83-75 — Coordinates N 366,509 — E 1,403,174 — Ground Elevation 3575

Depth and Elev of Water Level* Not Encountered — Location Station 3310+37.03, 10' left — Total Depth 20.0 feet

*Date Measured 9/01/83 — Date Begun 9/01/83 — Finished 9/01/83 — Logged by W. Henning — Reviewed by A. Stilley

NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By: Northern Engineering and Testing, Inc.

Drill Equipment: Mobile B-50 Rotary, Truck-mounted

Driller: B. Neff

Method: Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below

Drive Sample Intervals, feet:
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0

Progress Report: 0-20.0' 9/01/83 After augers were removed, hole remained open. Moderate to easy drilling. Installed 20' of 1½" diameter pvc pipe as observation well. Drilled 10' west of PI 114.

Hole Backfilled: 9/01/83

CORE RECOVERY*	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT)	GRAPHIC LOG
87	17	5	SPT	0.5	
				5.5	SM
33	21	2	SPT	10	GM
				11.0	
93	19	18	SPT		CL
60	18	18	SPT	20.0	

PENETRATION RESISTANCE — Blows per Foot — Weight of Hammer 140 lb — Height of Drop 30 in.

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 20% fine sand, 50% low plasticity fines, 30% organic material, Maximum Size fine sand, Color Brown, Moisture dry.

0.5'-5.5' SILTY SAND - about 70% fine to medium sand, 30% non-plastic fines, Maximum Size medium sand, Color Light Brown, Moisture dry, medium dense, alluvial, (SM).

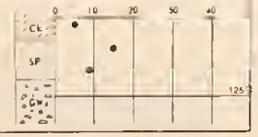
5.5'-11.0' SANDY GRAVEL - about 50% gravel, 30% fine to medium sand, 20% low plasticity fines, Maximum Size 3" rounded to subangular, Color Light Brown, Moisture slightly moist, medium dense to dense, alluvial, (GM).

11.0'-20.0' SILTY CLAY - about 10% gravel, 20% medium to coarse sand, 70% medium plasticity fines, Maximum Size 2" rounded to subangular, Color Brown, Moisture moist, very stiff, oxides, glacial till, (CL).

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated, thus, 50/.4 indicates 0.4 foot penetrated with 50 blows, extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type, with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot, as shown at right. Actual values ●, extrapolated values at 50, open circle with extrapolated value 125○

FEATURE Great Falls-Conrad 230 KV Transmission Line — STATE Montana — HOLE NO PR 83-75 — DWG NO GTF-CON 8020

49

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Hole No PR 83-80 — Coordinates N 365,504 — E 1,404,972 — Ground Elevation 3619

Depth and Elev of Water Level* Not Encountered — Location Station 3290+18.35, centerline — Total Depth 20.0 feet

*Date Measured 9/01/83 — Date Begun 9/01/83 — Finished 9/01/83 — Logged by W. Henning — Reviewed by A. Stilley

NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By: Northern Engineering and Testing, Inc.

Drill Equipment: Mobile B-50 Rotary, Truck-mounted

Driller: B. Neff

Method: Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below

Drive Sample Intervals, feet:
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0

Progress Report: 0-20.0' 9/01/83 After augers were removed, hole remained open. Moderate to easy drilling. Drilled 20' south of PI 115.

Hole Backfilled: 9/01/83

CORE RECOVERY*	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT)	GRAPHIC LOG
87	19	7	SPT	0.5	
				5.0	CH
87	47	8	SPT	10	
87	52	13	SPT		CL
93	34	14	SPT	20.0	

PENETRATION RESISTANCE — Blows per Foot — Weight of Hammer 140 lb — Height of Drop 30 in.

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 5% gravel, 20% fine to medium sand, 50% medium plasticity fines, 25% organic material, Maximum Size 1", Color Brown, Moisture dry.

0.5'-5.0' SILTY CLAY - about 20% fine sand, 80% medium to high plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist, very stiff, salts, redeposited glacial till, (CH)

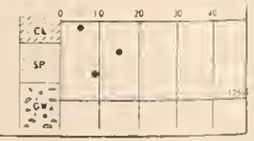
5.0'-20.0' SILTY CLAY - about 10% gravel, 20% fine to medium sand, 70% medium plasticity fines, Maximum Size 3" rounded to subangular, Color Brown, Moisture slightly moist, hard, salts, oxides, glacial till, (CL).

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated, thus, 50/.4 indicates 0.4 foot penetrated with 50 blows, extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type, with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot, as shown at right. Actual values ●, extrapolated values at 50, open circle with extrapolated value 125○



FEATURE Great Falls-Conrad 230 KV Transmission Line — STATE Montana — HOLE NO PR 83-80 — DWG NO GTF-CON 8021

50

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-85

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 3268+70, centerline Coordinates N 363,358 E 1,404,893 Ground Elevation 3644 Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 9/01/83 Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL (LETTER / SYMBOL)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART— UNIFIED SOILS CLASSIFICATION) GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATION	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
	0.0			0.0' - 0.5' TOPSOIL - about 5% gravel, 20% fine to medium sand, 50% medium plasticity fines, 25% organic material, Maximum Size 1", Color Brown, Moisture slightly moist			
		SPT N = 11	13				
				0.5' - 20.0' SILTY CLAY - about 10 gravel, 20% fine to medium sand, 70 plasticity fines, Maximum Size 3" rounded to subangular, Color Brown, Moisture slightly moist, stiff to very stiff, salts, oxides, glacial till, (CL)		0	0
CL		SPT N = 20	14				
		SPT N = 22	16				
	20.0	SPT N = 32	1				

REMARKS: Drilled by Northern Engineering & Testing, Inc
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After auger removed, hole remained open
Required Depth 20.0'
Hole Backfilled 9/01/83 - Drilled 1110' west of PI 116 centerline

Moderate Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-85 | DWG NO GTF-CON 8022

51

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-90

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 3215+75, centerline Coordinates N 358,067 E 1,404,699 Ground Elevation 3665 Approx Dimensions 18" Auger
Date & Depth to Water Not Encountered Method of Excavation Power Pole Auger Date 9/27/83 Logged by D. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOL (LETTER / SYMBOL)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART— UNIFIED SOILS CLASSIFICATION) GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATION	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
	0.4			0.0' - 0.4' TOPSOIL - about 5% fine sand, 85% low plasticity fines, 10% organic material, Maximum Size fine sand, Color Brown, Moisture dry to slightly moist, stiff			
		S. Sack	19				
				0.4' - 20.0' SILTY CLAY WITH GRAVEL - about 5% cobbles, 15% gravel, 15% sand, 65% medium plasticity fines, Maximum Size 4" subrounded, Color Brown, Moisture moist to slightly moist, very stiff, scattered salts, oxides, glacial till, (CL		5	0
CL		S. Sack	20				
		S. Sack	18				
	20.0	S. Sack	21				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger
After auger removed, hole stayed open.
Required Depth - 20.0', 9/27/83.
Hole Backfilled 9/27/83 - Drilled at PI 117

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-90 | DWG NO GTF-CON 8023

52

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-95

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 3163+66.56, 10' left Coordinates N 352,864 E 1,404,499 Ground Elevation 3689 Approx Dimensions 9" Auger
Date & Depth to Water 9/01/83, 9.0' Method of Excavation Mobile B-50 Date 9/01/83 Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL (LETTER / SYMBOL)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART— UNIFIED SOIL CLASSIFICATION) GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
	0.0			0.0' - 0.5' TOPSOIL - about 5% gravel, 15' fine to medium sand, 60' medium plasticity fines, 20% organic material, Maximum Size 1/2", Color Brown, Moisture slightly moist.			
		SPT N = 12	13				
CL				0.5' - 20.0' SILTY CLAY - about 10% gravel, 30% fine to medium sand, 60% medium plasticity fines, Maximum Size 3" rounded to subangular, Color Brown, Moisture moist to wet, stiff to very stiff, salt, carbon detritus, some scattered sand lenses, glacial till, (CL).		0	0
	9.0	SPT N = 9	20				
		SPT N = 12	20				
	20.0	SPT N = 14	19				

REMARKS: Drilled by Northern Engineering & Testing, Inc
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After auger removed, hole remained open.
Required Depth = 20.0'
Hole Backfilled 9/01/83 - Drilled 10' west of PI 118

20' of 1½" diameter pvc pipe installed as observation well.
Easy Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-95 | DWG NO GTF-CON 8024

53

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP -100

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 3109+34, 20' left Coordinates N 347,337 E 1,404,271 Ground Elevation 3679 Approx Dimensions ? Auger
Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 9/01/83 Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL (LETTER / SYMBOL)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART— UNIFIED SOILS CLASSIFICATION) GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
	0.5			0.0' - 0.5' TOPSOIL - about 5 gravel, 30% fine to medium sand, 50% low plasticity fines, 15% organic material, Maximum Size 1/2", Color Brown, Moisture slightly moist			
		SPT N = 12	11				
				0.5' - 2.5' SILTY CLAY WITH COBBLES - about 30% cobbles, 10 gravel, 20' fine to medium sand, 40% medium plasticity fines, Maximum Size 5" rounded to subangular, Color Brown, Moisture dry, very dense, road fill, (CL)			0
CL		SPT N = 12	18				
				2.5' - 20.0' SILTY CLAY - about 10% gravel, 30% fine to medium sand, 60% medium plasticity fines, Maximum Size 2" rounded to subangular, Color Brown, Moisture slightly moist, stiff to very stiff, reworked glacial till, (CL)			
		SPT N = 10	24				
	20.0	SPT N = 17	16				

REMARKS: Drilled by Northern Engineering & Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After auger removed, hole remained open
Required Depth = 20.0'
Hole Backfilled 9/01/83 - Drilled 5' south of PI 119.

Moderate Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-100 | DWG NO GTF-CON 8025

54

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-105

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 3056+10, centerline Coordinates N 342,117 E 1,404,078 Ground Elevation 3668 Approx Dimensions 18" Auger
Date & Depth to Water Not Encountered Method of Excavation Power Pole Auger Date 9/27/83 Logged by D. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOL (LETTER / SYMBOL)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART— UNIFIED SOIL CLASSIFICATION) GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
	0.4			0.0' - 0.4' TOPSOIL - about 80% low plasticity fines, 20' organic material, Maximum Size fine sand, Color Brown, Moisture dry to slightly moist, stiff			
		S. Sack	19				
				0.4' - 20.0' SILTY CLAY WITH GRAVEL - about 15% gravel, 20' sand, 65% medium plasticity fines, Maximum Size 3" subrounded, Color Brown, Moisture slightly moist, very stiff to hard, gypsum crystals, glacial till, (CL).		0	0
CL		S. Sack	15				
		S. Sack	21				
	20.0	S. Sack	21				

REMARKS: Drilled by Northern Engineering and Testing, Inc
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger.
After auger removed, hole stayed open
Required Depth - 20.0', 9/27/83.
Hole Backfilled 9/27/83 - Drilled 5' east of PI 120

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-105 | DWG NO GTF-CON 8026

55

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line State Montana

Hole No PR 83-110 Coordinates N 338,441 E 1,403,946 Ground Elevation 3678

Depth and Elev of Water Level* Not Encountered Location Station 3019+30.77, 15' right Total Depth 20.0 feet

*Date Measured 9/02/83 Date Begun 9/02/83 Finished 9/02/83 Logged by W. Henning Reviewed by A. Stilley

NOTES
Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50 Rotary, Truck-mounted

Driller
B. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below.

Drive Sample Intervals, feet
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0

Progress Report
0-20.0' 9/02/83
After augers were removed, hole remained open. Hard drilling. Drilled 15' east of PI 121.

Hole Backfilled
9/02/83

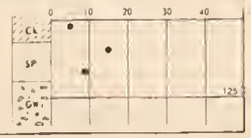
CORE RECOVERY-%	BLOWS/FOOT	WATER CONTENT-%	SAMPLES FOR TESTING	DEPTH (FT.)	GRAPHIC LOG	PENETRATION RESISTANCE Blows per Foot (Weight of Hammer 140 lb, Height of Drop 30 in)	CLASSIFICATION AND DESCRIPTION OF MATERIAL
				0.5			0.0'-0.5' TOPSOIL - about 20% fine sand, 60% low plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist.
86	32	9	SPT				
86	41	9	SPT	10	CL		0.5'-20.0' SILTY CLAY - about 10% gravel, 20% fine to medium sand, 70% medium plasticity fines, Maximum Size 3" rounded to sub-angular, Color Brown, Moisture slightly moist, hard, salts, carbon detritus, oxides, some sand lenses, glacial till, (CL).
80	43	12	SPT				
67	26	12	SPT	20.0			
				30			
				40			
				50			
				60			
				70			
				80			
				90			

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated thus: 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on in-place condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 50, open circle with extrapolated value 125.



FEATURE Great Falls-Conrad 230 KV Transmission Line STATE Montana HOLE NO PR 83-110 DWG NO GTF-CON 8027

56

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line State Montana

Hole No PR 83-115 Coordinates N 335,917 E 1,405,207 Ground Elevation 3514

Depth and Elev of Water Level* Not Encountered Location Station 2991+01.51, 10' right Total Depth 10.0'

*Date Measured 9/02/83 Date Begun 9/02/83 Finished 9/02/83 Logged by W. Henning Reviewed by A. Stilley

NOTES
Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50 Rotary, Truck-mounted

Driller
B. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below.

Drive Sample intervals, feet
3.0 - 4.5
8.0 - 8.1

Progress Report
0-10.0' 9/02/83
Installed 10.0' of 1" diameter pvc pipe as observation well. After auger removed, hole caved to 5.0'. Auger refusal at 10.0'. Hard drilling. Drilled 10' east of PI 122.

Hole Backfilled
9/02/83

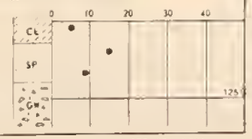
CORE RECOVERY-%	BLOWS/FOOT	WATER CONTENT-%	SAMPLES FOR TESTING	DEPTH (FT.)	GRAPHIC LOG	PENETRATION RESISTANCE Blows per Foot (Weight of Hammer 140 lb, Height of Drop 30 in)	CLASSIFICATION AND DESCRIPTION OF MATERIAL
67	20	2	SPT	0.5	SP-SM		0.0'-0.5' TOPSOIL - about 30% fine to medium sand, 50% medium plasticity fines, 20% organic material, Maximum Size medium sand, Color Brown, Moisture slightly moist.
0	50/0.1	-	SPT	10.0		500	0.5'-10.0' GRAVELLY SAND - about 30% gravel, 60% fine to medium sand, 10% low plasticity fines, Maximum Size 3" rounded to sub-rounded, Color Brown, Moisture slightly moist, medium dense, alluvial, (SP-SM).
				20			Bottom of Hole at 10.0' Auger Refusal
				30			
				40			
				50			
				60			
				70			
				80			
				90			

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated thus: 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on in-place condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 50, open circle with extrapolated value 125.



FEATURE Great Falls-Conrad 230 KV Transmission Line STATE Montana HOLE NO PR 83-115 DWG NO GTF-CON 8028

57

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line State Montana

Hole No PR 83-120 Coordinates N 334,813 E 1,405,477 Ground Elevation 3601

Depth and Elev of Water Level* Not Encountered Location Station 2979+66.73, centerline Total Depth 20.0 feet

*Date Measured 9/02/83 Date Begun 9/02/83 Finished 9/02/83 Logged by W. Henning Reviewed by A. Stilley

NOTES
Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment:
Mobile B-50 Rotary, Truck-mounted

Driller
B. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below.

Drive Sample Intervals, feet
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0

Progress Report
0-20.0' 9/02/83
After augers were removed, hole remained open. Moderate drilling. Drilled 10' south of PI 193.

Hole Backfilled
9/02/83

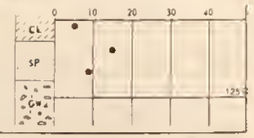
CORE RECOVERY-%	BLOWS/FOOT	WATER CONTENT-%	SAMPLES FOR TESTING	DEPTH (FT.)	GRAPHIC LOG	PENETRATION RESISTANCE Blows per Foot (Weight of Hammer 140 lb, Height of Drop 30 in)	CLASSIFICATION AND DESCRIPTION OF MATERIAL
				0.5			0.0'-0.5' TOPSOIL - about 20% medium to fine sand, 60% low plasticity fines, 20% organic material, Maximum Size medium sand, Color Brown, Moisture slightly moist.
87	34	6	SPT				
93	31	9	SPT	10	CL		0.5'-20.0' SILTY CLAY - about 10% gravel, 30% fine to coarse sand, 60% medium plasticity fines, Maximum Size 3" rounded to sub-angular, Color Brown, Moisture slightly moist, hard to very stiff, salts, oxides, glacial till, (CL).
80	26	13	SPT				
100	19	15	SPT	20.0			
				30			
				40			
				50			
				60			
				70			
				80			
				90			

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated thus: 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on in-place condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 50, open circle with extrapolated value 125.



FEATURE Great Falls-Conrad 230 KV Transmission Line STATE Montana HOLE NO PR 83-120 DWG NO GTF-CON 8029

58

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana

Hole No: PR 83-125 — Coordinates N 448,767 E 1,405,486 — Ground Elevation: 3659

Depth and Elev of Water Level*: Not Encountered — Location: Station 2975+16.76, centerline — Total Depth: 20.0 feet

*Date Measured: 9/02/83 — Date Begun: 9/02/83 — Finished: 9/02/83 — Logged by: W. Henning — Reviewed by: A. Stilley

NOTES
Water losses, type and size of hole, drilling method and conditions. Caving and other information

Furnished By
Northern Engineering and Testing, Inc

Drill Equipment
Mobile B-50
Rotary, truck mounted

Driller
E. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below.

Drive Sample Intervals, Feet
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0

Progress Report
9/06/83
After augers were removed, hole remained open. Moderate drilling. Drilled 10' south of PI 123.

Hole Backfilled
9/06/83

CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT)	GRAPHIC LOG
80	30	11	SPT	0.5	
100	21	17	SPT		CL
67	14	16	SPT	10	
87	23	12	SPT	20.0	
				30	
				40	
				50	
				60	
				70	
				80	
				90	

PENETRATION RESISTANCE
Blows per Foot
Weight of Hammer: 140 lb
Height of Drop: 30 in
0 10 20 30 40 50

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 30% fine to medium sand, 50% medium plasticity fines, 20% organic material, Maximum Size medium sand, Color Brown, Moisture slightly moist

0.5'-20.0' SILTY CLAY - about 10% gravel, 20% fine to coarse sand, 70% medium plasticity fines, Maximum Size 3" rounded to subangular, Color Brown, Moisture slightly moist to moist, hard to stiff, salts, carbon detritus, oxides, glacial till, (CL)

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated, thus, 50/.4 indicates 0.4 feet penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on in-place condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, clay cemented (SP).

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 50, open circle with extrapolated value 125.

FEATURE: Great Falls - Conrad 230 KV Transmission Line — STATE: Montana — HOLE NO: PR 83-125 — DWG NO: TF-CON 8036

59

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No: AP 83-130

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana
Station: 2967+45, 15' left — Coordinates N 331,594 E 1,405,389 — Ground Elevation: 3685 — Approx. Dimensions: 9" Auger
Date & Depth to Water: Not Encountered — Method of Excavation: Mobile B-50 — Date: 9/06/83 — Logged By: W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL (LETTER)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SOIL CHART — UNIFIED SOIL CLASSIFICATION SYSTEM; GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
	0.5			0.0' - 0.5' TOPSOIL - about 10% fine gravel, 20% fine to medium sand, 50% medium plasticity fines, 20% organic material, Maximum Size 1", Color Brown, Moisture slightly moist			
		SPT N = 31	7				
CL		SPT N = 91	11	0.5' - 20.0' SILTY CLAY - about 10% gravel, 20% fine to coarse sand, 70% medium plasticity fines, Maximum Size 3" rounded to subangular, Color Brown, Moisture slightly moist, stiff to hard, salts, carbon detritus, oxides, glacial till (CL)		0	0
		SPT N = 59	8				
	20.0	SPT N = 22	13				

REMARKS: Drilled by Northern Engineering and Testing, Inc
Mobile Drill Model B-50 with 9" hollowstem augers used
After augers removed, hole stayed open
Required Depth = 20.0'
Hole Backfilled 9/06/83 - Drilled 0' east of PI 124

Hard Drilling

NOTE: Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO: AP 83-130 — DWG NO: GTF-CON 8031

60

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No: AP 83-135

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana
Station: 2893+60, 70' right — Coordinates N 326,140 E 1,405,314 — Ground Elevation: 3735 — Approx. Dimensions: 9" Auger
Date & Depth to Water: Not Encountered — Method of Excavation: Mobile B-50 — Date: 9/06/83 — Logged By: W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL (LETTER)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SOIL CHART — UNIFIED SOIL CLASSIFICATION SYSTEM; GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
	0.5			0.0' - 0.5' TOPSOIL - about 30% fine to medium sand, 50% low plasticity fines, 20% organic material, Maximum Size medium sand, Color Brown, Moisture slightly moist			
		SPT N = 13	8				
CL		SPT N = 16		0.5' - 20.0' SILTY CLAY - about 10% gravel, 20% fine to medium sand, 70% medium plasticity fines, Maximum Size 3" rounded to subangular, Color Brown, Moisture slightly moist, stiff to very stiff, salts, carbon detritus, glacial till, (CL)		0	0
		SPT N = 12	14				
	20.0	SPT N = 17	17				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill Model B-50 with 9" hollowstem augers used
After auger s removed, hole stayed open
Required Depth = 20.0'
Hole Backfilled 9/06/83 - Drilled at 5' south of PI 125

Moderate Drilling

NOTE: Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO: AP 83-135 — DWG NO: GTF-CON 8032

61

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No: AP 83-140

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana
Station: 2884+54, 50' right — Coordinates N 325,305 E 1,405,268 — Ground Elevation: 3740 — Approx. Dimensions: 18" Auger
Date & Depth to Water: Not Encountered — Method of Excavation: Power Pole Auger — Date: 9/27/83 — Logged By: D. Syrstad

UNIFIED SOIL CLASSIFICATION SYMBOL (LETTER)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SOIL CHART — UNIFIED SOIL CLASSIFICATION SYSTEM; GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
	0.4			0.0' - 0.4' TOPSOIL - about 10% fine sand, 80% low plasticity fines, 10% organic material, Maximum Size fine sand, Color Brown, Moisture dry to slightly moist, firm to stiff.			
		S. Sack	12				
CL		S. Sack	16	0.4' - 20.0' SILTY CLAY WITH GRAVEL - about 5% cobbles, 10% gravel, 20% sand, 65% medium plasticity fines, Maximum Size 4" subangular, Color Brown, Moisture dry to moist, very stiff, glacial (TT), (CL)		5	0
		S. Sack	18				
	20.0	S. Sack	18				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger
After auger removed, hole stayed open.
Required Depth = 20.0', 9/27/83
Hole Backfilled 9/27/83 - Drilled 500' south of PI 125.

NOTE: Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO: AP 83-140 — DWG NO: GTF-CON 8033

62

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No: AP 83-145

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana
Station: 2853+60, 25' right — Coordinates N [illegible] E 1,405,352 — Ground Elevation: 3755 — Approx. Dimensions: 9" Auger
Date & Depth to Water: Not Encountered — Method of Excavation: Mobile B-50 — Date: 9/06/83 — Logged By: W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL (LETTER)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SOIL CHART — UNIFIED SOIL CLASSIFICATION SYSTEM; GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOL. OF PLUS 5 INCH
	0.5			0.0' - 0.5' TOPSOIL - about 30% fine to medium sand, 50% low plasticity fines, 20% organic material, Maximum Size medium sand, Color Brown, Moisture dry			
		SPT N = 15	12				
CL		SPT N = 12	20	0.5' - 20.0' SILTY CLAY - about 10% gravel, 20% fine to medium sand, 70% medium plasticity fines, Maximum Size 3" rounded to subangular, Color Brown, Moisture slightly moist to moist, stiff to very stiff, salts, carbon detritus, glacial till, (CL)		[illegible]	0
		SPT N = 14	20				
	20.0	SPT N = 16	16				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill Mode B-50 with 9" hollowstem augers used
After augers removed, hole stayed open.
Required Depth = 20.0'
Hole Backfilled 9/06/83 - Drilled at 15' north of PI 126

Moderate Drilling

NOTE: Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO: AP 83-145 — DWG NO: GTF-CON 8034

63

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-150

Project Great Falls - Conrad 230 KV Transmission Line State Montana
Station 2800+82.05, 90' right Coordinates N 316,937 E 1,405,061 Ground Elevation 3803 Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 9/06/83 Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL (CODE)	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
		0.5			0.0' - 0.5' TOPSOIL - about 30% fine to medium sand, 50% low plasticity fines, 20% organic material, Maximum Size medium sand, Color Brown, Moisture slightly moist.			
CH			SPT N = 9	9	0.5' - 16.0' FAT CLAY - about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, soft, blocky some salts, lacustrine, (CH).			
			SPT N = 10	27				
			SPT N = 13	19			0	0
		16.0						
CL			SPT N = 53	9	16.0' - 20.0' SILTY CLAY - about 5% gravel, 25% fine to medium sand, 70% medium plasticity fines, Maximum Size 1/2", Color Brown, Moisture slightly moist, hard, salts, oxides, carbon detritus, glacial till, (CL).			
		20.0						

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill Model B-50 with 9" hollowstem augers used.
After augers removed, hole stayed open
Required Depth = 20.0'
Hole Backfilled 9/06/83 - Drilled at 10' north of PI 127.

Easy to Moderate Drilling

HOLE NO AP 83-150 DWG NO GTF-CON 8035

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

64

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-155

Project Great Falls - Conrad 230 KV Transmission Line State Montana
Station 2774+43, 90' right Coordinates N 314,299 E 1,404,983 Ground Elevation 3798 Approx Dimensions 18" Auger
Date & Depth to Water 19.0' 9/28/83 Method of Excavation Power Pole Auger Date 9/28/83 Logged by O. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOL (CODE)	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
		0.4			0.0' - 0.4' TOPSOIL - about 10% fine sand, 60% low plasticity fines, 30% organic material, Maximum Size fine sand, Color Brown, Moisture dry to slightly moist, stiff.			
CL			S. Sack	23	0.4' - 13.0' SILTY CLAY WITH GRAVEL AND COBBLES - about 10% cobbles, 25% gravel, 10% fine sand, 55% medium plasticity fines, Maximum Size 10" subangular, Color Brown, Moisture slightly moist to very moist, stiff, glacial till, (CL)		7	3
			S. Sack	11				
		13.0			13.0' - 19.0' FAT CLAY - about 5% fine sand, 95% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture very moist to wet, hard, (CH).			
CH			S. Sack	24	19.0' - 20.0' SHALE CLAYSTONE - soft rock, Colorado Group, recovered as about 5% fine sand, 95% high plasticity fines, Maximum Size fine sand, Color Dark Gray, Moisture moist.		0	0
		19.0	S. Sack	12			0	0
		20.0						

REMARKS Drilled by Northern Engineering and Testing, Inc.
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger.
After auger removed, hole stayed open.
Required Depth = 20.0', 9/28/83.
Hole Backfilled 9/28/83 - Drilled 7' northwest of PI 128.

20.0' of perforated 13" pvc pipe installed as observation well.

HOLE NO AP 83-155 DWG NO GTF-CON 8036

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

65

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line State Montana

Hole No PR 83-160 Coordinates N 311,607 E 1,404,803 Ground Elevation 3836
Depth and Elev of Hole Level Not Encountered Location Station 2747+35.90, centerline Total Depth 20.0 feet
*Date Measured 9/07/83 Date Begun 9/07/83 Finished 9/07/83 Logged by W. Henning Reviewed by A. Stilley

NOTES
Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50 Rotary, Truck-mounted

Driller
G. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below.

Drive Sample Intervals, Feet
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.0 - 20.0

Progress Report
9:25 - 9
After augers were removed, hole remained open
Moderate drilling.
Drilled 80' west of PI 129

Hole Backfilled
9:07 53

CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT.)	GRAPHIC LOG
87	10	12	SPT		CH
93	47	13	SPT	7.0	
93	65	11	SPT	10	
67	50/.5	17	SPT	20.0	

PENETRATION RESISTANCE Blows per Foot
Weight of Hammer 140 lb
Height of Drop 30 in
0 10 20 30 40 50
65
100

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.7' FAT CLAY - about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, firm, blocky, lacustrine (CH).

7.0'-20.0' SHALE CLAYSTONE - soft shale, thinly bedded, fractured, some selenite fragments, Colorado Group, recovered as 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture moist.

EXPLANATION

BLOWS/FOOT Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated, thus: 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION Describe soil type with emphasis on in-place condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines. Max size 1-1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE Plotted as shown at right. Actual values ●. Extrapolated values at 50 open circle with extrapolated value 125.

0 10 20 30 40
CL
SP
CH
125

FEATURE Great Falls - Conrad 230 K.V. Transmission Line STATE Montana HOLE NO PR 83-160 DWG NO GTF-CON 8035

66

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-165

Project Great Falls - Conrad 230 KV Transmission Line State Montana
Station 2730+16, 40' left Coordinates N 311,660 E 1,403,084 Ground Elevation 3827 Approx Dimensions 9" Auger
Date & Depth to Water 9/07/83, 8.0' Method of Excavation Mobile B-50 Date 9/07/83 Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL (CODE)	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
		0.5			0.0' - 0.5' TOPSOIL - about 20% fine to medium sand, 60% medium plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist			
			SPT N = 8	16	0.5' - 20.0' SILTY CLAY - about 20% fine sand, 80% medium plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, firm to stiff, salts, glacial till, (CL).			
CL		8.0	SPT N = 4	23			0	0
			SPT N = 4	27				
		20.0	SPT N = 15	22				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill Model B-50 with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.0'
Hole Backfilled 9/07/83 - Drilled at 10' north of PI 130

Easy drilling.
Notes: 20' of 1½" diameter pvc pipe installed as observation well.

HOLE NO AP 83-165 DWG NO GTF-CON 8038

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

67

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-170

Project Great Falls - Conrad 230 KV Transmission Line State Montana
Station 2695+65, 90' left Coordinates N 311,738 E 1,399,634 Ground Elevation 3836 Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 9/07/83 Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL (CODE)	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
		0.5			0.0' - 0.5' TOPSOIL - about 5% fine gravel, 20% fine to medium sand, 50% low plasticity fines, 25% organic material, Maximum Size 1", Color Brown, Moisture slightly moist			
CH			SPT N = 10	13	0.5' - 8.5' FAT CLAY - about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, firm to stiff, salts, redeposited glacial till, (CH).			
GC		8.5	SPT N = 31	8	8.5' - 10.0' CLAYEY GRAVEL - about 50% fine to medium gravel, 20% fine to coarse sand, 30% medium plasticity fines, Maximum size ¾" angular to subrounded, Color Brown, Moisture slightly moist, dense, alluvial, (GC).		0	0
		10.0	SPT N = 35	6				
			SPT N = 70	5	10.0' - 20.0' SHALE CLAYSTONE - soft rock, thinly bedded, fractured, selenite, Colorado Group, recovered as about 10% fine sand, 90% medium plasticity fines, Maximum Size fine sand, Color Black, Moisture slightly moist.			
		20.0						

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill Model B-50 with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.0'
Hole Backfilled 9/07/83 - Drilled at 10' south of PI 131.

Easy drill to 8', then hard drilling.

HOLE NO AP 83-170 DWG NO GTF-CON 8039

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

68

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature: Great Falls - Conrad 230 kV Transmission Line — State: Montana

Hole No: PR 83-175 — Coordinates N: 311,656 E: 1,397,079 — Ground Elevation: 3868

Depth and Elev of Water Level*: Not Encountered — Location: Station 2670-00.62, centerline — Total Depth: 20.0 feet

*Date Measured: 9 07 83 — Date Begun: 9 07 83 — Finished: 9/07/83 — Logged by: K. Henning — Reviewed by: A. Stilley

NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By: Northern Engineering and Testing, Inc.

Drill Equipment: Mobile B-50 Rotary, Truck-mounted.

Driller: S. Neff

Method: Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below.

Drive Sample Intervals, Feet: 3.0 - 4.5; 8.0 - 9.5; 13.0 - 14.5; 19.0 - 20.0

Progress Report: 0-20.0' 9 07 83. After augers were removed, hole remained open. Moderate to hard drilling. Drilled at 10' south of PI 132.

Hole Backfilled: 9/0 83

DEPTH (FT)	CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	GRAPHIC LOG
0.5					SP-SM
9.0	67	30	9	SPT	
11.0	20	55	3	SPT	SM
20.0	87	61	8	SPT	
	67	60../.5	10	SPT	

PENETRATION RESISTANCE — Blows per Foot; Weight of Hammer: 140 lb; Height of Drop: 30 in.

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 15% fine gravel, 20 fine to medium sand, 40% medium plasticity fines, 25' organic material, Maximum Size 3", Color Brown, Moisture slightly moist

0.5'-9.0' GRAVELLY SAND - about 20% medium to coarse gravel, 70% fine to coarse sand, 10% low plasticity fines, Maximum Size 3" angular to subrounded, Color Brown, Moisture slightly moist, dense, terrace deposit, some clay pockets, (SP-SM).

9.0'-11.0' SILTY SAND - about 60 sand, 40% low plasticity fines, Maximum Size medium sand, Color Brown, Moisture moist, dense, (SM).

11.0'-20.0' SHALE, CLAYSTONE - soft rock, thinly bedded, fractured, oxides, selenite, Colorado Group, recovered as about 10 fine sand, 90 high plasticity fines, Maximum Size fine sand, Color Black, Moisture slightly moist

EXPLANATION

BLOWS FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated thus, 50 - 4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines max size 1 4 inch, thm, moist, gray, uncemented (SP)

PENETRATION RESISTANCE — Plot, as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125

FEATURE: Great Falls-Conrad 230 kV Transmission Line — STATE: Montana — HOLE NO PR: 83-175 — DWG NO: GTF-CON 8040

69

LOG OF TEST PIT OR AUGER HOLE FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No: AP 83-180

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana

Station: 2654+02, 15' left — Coordinates N: 310,061 E: 1,397,009 — Ground Elevation: 3903 — Approx Dimensions: 18" Auger

Date & Depth to Water: Not Encountered — Method of Excavation: Power Pole Auger — Date: 9/28/83 — Logged by: D. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOL (CHART)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)
	0.4		
GM		S. Sack	4
	9.0	S. Sack	14
CL		S. Sack	13
	14.5		

CLASSIFICATION AND DESCRIPTION OF MATERIAL (USE CHART — UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)

0.0' - 0.4' TOPSOIL - about 10% fine sand, 70' low plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist, stiff.

0.4' - 9.0' SILTY GRAVEL - about 5% cobbles, 55% gravel, 25' fine sand, 15' slightly plasticity fines, Maximum Size 4" subrounded, Color Brown, Moisture slightly moist to moist, dense, glacial till, (GM).

9.0' - 14.5' SILTY CLAY WITH GRAVEL - about 10% gravel, 15% sand, 75% medium plasticity fines, Maximum Size 3" subrounded, Color Brown, Moisture moist, stiff to very stiff, glacial till, (CL).

Auger refusal at 14.5 in gravel and cobbles.

PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
	5	0
	0	0

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger.
Hole caved to 5' after auger removal.
Auger refusal at 14.5'.
Hole Backfilled 9/28/83 - Drilled at PI 133.

NOTE: Unless otherwise indicated % by volume of 3-5 & plus 5 material is estimated

HOLE NO: AP 83-180 — DWG NO: GTF-CON 8041

70

LOG OF TEST PIT OR AUGER HOLE FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No: AP 83-185

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana

Station: 2620+94, 200' right — Coordinates N: 306,748 E: 1,397,110 — Ground Elevation: 4081 — Approx Dimensions: 9" Auger

Date & Depth to Water: Not Encountered — Method of Excavation: Mobile 8-50 — Date: 9/07/83 — Logged by: W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL (CHART)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)
		SPT N = 22	11
		SPT N = 25	9
		SPT N = 39	10
	20.0	SPT N = 39	11

CLASSIFICATION AND DESCRIPTION OF MATERIAL (USE CHART — UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)

0.0' - 20.0' SHALE CLAYSTONE - soft rock, thinly bedded, fractured in part, some selenite throughout, Colorado Group, recovered as about 10% fine sand, 90 high plasticity fines, Maximum Size fine sand, Color Black, Moisture slightly moist.

PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
	0	0

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill B-50 with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.0'
Hole Backfilled 9/07/83 - Drilled at 25' south of PI 134.

Difficult Drilling

NOTE: Unless otherwise indicated % by volume of 3-5 & plus 5 material is estimated

HOLE NO: AP 83-185 — DWG NO: GTF-CON 8042

71

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana

Hole No PR 83-190 — Coordinates N: 305,949 E: 1,396,882 — Ground Elevation: 4200

Depth and Elev of Water Level*: Not Encountered — Location: Station 2612+87, centerline — Total Depth: 12.0 feet

*Date Measured: 9/09/83 — Date Begun: 9/07/83 — Finished: 9 09 83 — Logged by: K. Henning — Reviewed by: A. Stilley

NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By: Northern Engineering and Testing, Inc.

Drill Equipment: Mobile B-50 Rotary, Truck-mounted

Driller: S. Neff

Method: Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below.

Drive Sample Intervals, Feet: 3.0 - 3.1; 8.0 - 8.9

Progress Report: 0-12.0' 9 09 83. Auger refusal at 12'. After auger removed, hole caved to 5 feet. Very hard drilling.

Hole Backfilled: 9 09 83

Corrected Total Depth: 4/13/84 els

DEPTH (FT)	CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	GRAPHIC LOG
0.5					GW-GM
12.0	0	50../.1	--	SPT	
	20	50../.4	1	SPT	

PENETRATION RESISTANCE — Blows per Foot; Weight of Hammer: 140 lb; Height of Drop: 30 in.

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 20% gravel, 20 medium to coarse sand, 40 low plasticity fines, 20 organic material, Maximum Size 3", Color Brown, Moisture dry

0.5'-12.0' SANDY GRAVEL WITH COBBLES - about 60 fine to coarse gravel, 30 medium to coarse sand, 10% low plasticity fines, Maximum Size 5" rounded to subangular, Color Light Brown, Moisture dry, very dense, terrace gravel, GW-GM

Bottom of Hole at 12.0 - Auger Refusal

EXPLANATION

BLOWS FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated thus, 50 - 4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines max size 1 4 inch, thm, moist, gray, uncemented (SP)

PENETRATION RESISTANCE — Plot, as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125

FEATURE: Great Falls-Conrad 230 kV Transmission Line — STATE: Montana — HOLE NO PR: 83-190 — DWG NO: GTF-CON 8043

72

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-195

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 2565+48, 10' right — Coordinates N 301,213 E 1,396,728 — Ground Elevation 3979 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 9/12/83 — Logged by W. Henning

Unified Soil Classification Symbol (Letter)	Graphic	Depth (Feet)	Size and Type of Sample Taken	In Place Moisture (-)	Classification and Description of Material (See Chart—Unified Soil Classification. Give Geologic and In Place Description for Foundation Investigations)	Percent Moisture	Percentage by Volume of 3-5 Inch	Percentage by Volume of Plus 5-Inch
CH		0.5	SPT N = 22	6	0.0' - 0.5' TOPSOIL - about 5% gravel, 30% fine to medium sand, 50% low plasticity fines, 15% organic material, Maximum Size 1/2", Color Brown, Moisture dry.		0	0
		5.0	SPT N = 37	6	0.5' - 5.0' FAT CLAY - about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture moist, very stiff, blocky, salts, (CH).			
			SPT N=567.5	5	5.0' - 20.0' CLAYSTONE SHALE - soft rock, blocky, some thinly bedded areas, selenite fragments, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray-Brown, Moisture slightly moist.			
		20.0	SPT N=115	4				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.0'
Hole Backfilled 9/12/83 - Drilled at PI 135.
Moderate Drilling.

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

Hole No AP 83-195 — DWG No GTF-CON 8044

73

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-200

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 2512+43, 40' right — Coordinates N 295,911 E 1,396,575 — Ground Elevation 3926 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 9/12/83 — Logged by W. Henning

Unified Soil Classification Symbol (Letter)	Graphic	Depth (Feet)	Size and Type of Sample Taken	In Place Moisture (-)	Classification and Description of Material (See Chart—Unified Soil Classification. Give Geologic and In Place Description for Foundation Investigations)	Percent Moisture	Percentage by Volume of 3-5 Inch	Percentage by Volume of Plus 5-Inch
GP-GM		0.5			0.0' - 0.5' TOPSOIL - about 20% fine to medium sand, 60% medium plasticity fines, 20% organic material, Maximum Size medium sand, Color Brown, Moisture slightly moist		0	0
		1.5	SPT N = 27	8	0.5' - 1.5' - SANDY GRAVEL - about 60% gravel, 30% fine to coarse sand, 10% non-plastic fines, Maximum Size 2", Color Brown, Moisture dry, roadfill, (GP-GM).			
			SPT N = 37	11	1.5' - 20.0' CLAYSTONE SHALE - soft rock, blocky, some thinly layered zones, oxides, selenite, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray-Brown, Moisture slightly moist.			
			SPT N=507.5	7				
		20.0	SPT N=557.5	9				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.0'
Hole Backfilled 9/12/83 - Drilled at PI 136.
Difficult Drilling.

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

Hole No AP 83-200 — DWG No GTF-CON 8045

74

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-201

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 2461+10, centerline — Coordinates N 290,784 E 1,396,357 — Ground Elevation 3937 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 9/12/83 — Logged by W. Henning

Unified Soil Classification Symbol (Letter)	Graphic	Depth (Feet)	Size and Type of Sample Taken	In Place Moisture (-)	Classification and Description of Material (See Chart—Unified Soil Classification. Give Geologic and In Place Description for Foundation Investigations)	Percent Moisture	Percentage by Volume of 3-5 Inch	Percentage by Volume of Plus 5-Inch
		0.5	SPT N = 12	7	0.0' - 0.5' TOPSOIL - about 5% gravel, 20% fine to medium sand, 50% medium plasticity fines, 25% organic material, Maximum Size 1", Color Brown, Moisture slightly moist.			
			SPT N = 26	7	0.5' - 20.3' CLAYSTONE SHALE - soft rock, thinly bedded, blocky, fractured, oxides, selenite, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist.			
			SPT N = 54	8				
		20.3	SPT N=577.8	4				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.3'
Hole Backfilled 9/12/83 - Drilled 670' north of PI 137
Moderate Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

Hole No AP 83-201 — DWG No GTF-CON 8046

75

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-205

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 2454+21.21, 15' right — Coordinates N 290,095 E 1,396,349 — Ground Elevation 3964 — Approx Dimensions 18" Auger
Date & Depth to Water Not Encountered — Method of Excavation Power Pole Auger — Date 9/28/83 — Logged by O. Sykora

Unified Soil Classification Symbol (Letter)	Graphic	Depth (Feet)	Size and Type of Sample Taken	In Place Moisture (-)	Classification and Description of Material (See Chart—Unified Soil Classification. Give Geologic and In Place Description for Foundation Investigations)	Percent Moisture	Percentage by Volume of 3-5 Inch	Percentage by Volume of Plus 5-Inch
		0.4	S. Sack	6	0.0' - 0.4' TOPSOIL - about 10% fine sand, 70% low plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture dry to slightly moist, stiff.		0	0
			S. Sack	16	0.4' - 20.0' SHALE CLAYSTONE - soft rock, weathered, Colorado Group, recovered as about 10" fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Dark Gray, Moisture slightly moist to moist.			
			S. Sack	14				
		20.0	S. Sack	16				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger.
After auger removed, hole stayed open.
Required Depth = 20.0', 9/28/83.
Hole Backfilled 9/28/83 - Drilled 10' east of PI 137

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

Hole No AP 83-205 — DWG No GTF-CON 8047

76

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-210

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 2408+63, 25' right — Coordinates N 285,539 E 1,396,245 — Ground Elevation 4029 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 9/13/83 — Logged by W. Henning

Unified Soil Classification Symbol (Letter)	Graphic	Depth (Feet)	Size and Type of Sample Taken	In Place Moisture (-)	Classification and Description of Material (See Chart—Unified Soil Classification. Give Geologic and In Place Description for Foundation Investigations)	Percent Moisture	Percentage by Volume of 3-5 Inch	Percentage by Volume of Plus 5-Inch
CL		0.5	SPT N = 13	12	0.0' - 0.5' TOPSOIL - about 5% gravel, 20% fine to coarse sand, 50% medium plasticity fines, 25% organic material, Maximum Size 1", Color Brown, Moisture slightly moist.		0	0
		8.0	SPT N = 31	12	0.5' - 8.0' SANDY CLAY WITH GRAVEL - about 5% fine gravel, 30% fine to medium sand, 65% medium plasticity fines, Maximum Size 1", subrounded to angular, Color Brown, Moisture moist, stiff, salts, alluvial, (CL).			
			SPT N = 51	14	8.0' - 20.0' CLAYSTONE SHALE - soft rock, blocky, oxides, selenite fragments, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist			
		20.0	SPT N = 70	20				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.0'
Hole Backfilled 9/13/83 - Drilled 10' north of PI 138.
Moderate Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

Hole No AP 83-210 — DWG No GTF-CON 8048

77

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-215

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 2354+95, 125' left — Coordinates N 280,177 E 1,395,961 — Ground Elevation 4015 — Approx Dimensions 9" Auger
Date & Depth to Water 9/13/83 - 7.0' — Method of Excavation Mobile B-50 — Date 9/13/83 — Logged by W. Henning

Unified Soil Classification Symbol (Letter)	Graphic	Depth (Feet)	Size and Type of Sample Taken	In Place Moisture (-)	Classification and Description of Material (See Chart—Unified Soil Classification. Give Geologic and In Place Description for Foundation Investigations)	Percent Moisture	Percentage by Volume of 3-5 Inch	Percentage by Volume of Plus 5-Inch
GP-GM		1.0	SPT N=507.3	2	0.0' - 1.0' TOPSOIL - about 5% medium gravel, 20% fine to medium sand, 50% medium plasticity fines, 25% organic material, Maximum Size 1", Color Brown, Moisture slightly moist.		0	0
		6.0			1.0' - 6.0' SANDY GRAVEL - about 60% medium gravel, 30% fine to medium sand, 10% low plasticity fines, Maximum Size 3" rounded to subangular, Color Light Brown, Moisture dry, very dense, caliche, Terrace gravels, (GP-GM).			
		7.0	SPT N = 16	20	6.0' - 20.0' CLAYSTONE SHALE - soft rock, thinly bedded, blocky zones, oxides, slightly weathered, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist to moist			
			SPT N = 28	13				
		20.0	SPT N = 60	15				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.0'
Hole Backfilled 9/13/83 - Drilled 10' south of PI 139.
Moderate Drilling
20' of perforated 1½" diameter pvc pipe installed as monitoring well.

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

Hole No AP 83-215 — DWG No GTF-CON 8049

78

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-220

Feature Great Falls - Conrad 230 kV Transmission Line — State Montana
Station 2302+63, 40' left — Coordinates N 274,946 E 1,395,915 — Ground Elevation 3909 — Approx Dimensions 18" Auger
Date & Depth to Water Not Encountered — Method of Excavation Power Pole Auger — Date 9/28/83 — Logged by D. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOL	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION. GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL	0.4	S. Sack	13	0.0' - 0.4' TOPSOIL - about 10% fine sand, 70% low plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture dry to slightly moist, firm to stiff			
	7.0	S. Sack	13	0.4' - 7.0' SILTY CLAY WITH GRAVEL - about 5% gravel, 5% fine sand, 90% medium plasticity fines, Maximum Size ½" subrounded, Color Brown, Moisture slightly moist to moist, stiff to hard, (CL).		0	0
		S Sack	12	7.0' - 20.0' SHALE CLAYSTONE - soft rock, Colorado Group, recovered as about 5% fine sand, 95% high plasticity fines, Maximum Size fine sand, Color Gray Brown, Moisture moist		0	0
	20.0	S. Sack	11				

REMARKS Drilled by Northern Engineering and Testing, Inc
Power Pole Auger - Truck-mounted, Highway (Model HCAM5) with 18" auger
After auger removed, hole stayed open.
Required Depth = 20.0', 9/28/83
Hole Backfilled 9/28/83 - Drilled 6' west of PI 140.

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

NOTE NO AP 83-220 — DWG NO GTF-CON 8050

79

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-225

Feature Great Falls - Conrad 230 kV Transmission Line — State Montana
Station 2276+24, 400' right — Coordinates N 272,317 E 1,396,289 — Ground Elevation 3874 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 9/13/83 — Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION. GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
GP-GM	1.0	SPT N = 63	2	0.0' - 1.0' TOPSOIL - about 10% fine gravel, 20% fine to medium sand, 50% medium plasticity fines, 20% organic material, Maximum Size 1", Color Brown, Moisture slightly moist.		0	0
	4.5	SPT N = 42	8	1.0' - 4.5' SANDY GRAVEL - about 60' fine to medium gravel, 30" fine to medium sand, 10. low plasticity fines, Maximum Size 3", Color Brown, Moisture dry, very dense, caliche, terrace gravels, (GP-GM).			
		SPT N = 66	8	4.5' - 20.0' CLAYSTONE SHALE - soft rock, thinly bedded, blocky zones, some fracturing, slightly weathered, oxides, Colorado Group, recovered as about 10% fine sand, 90" high plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist.			
	20.0	SPT N = 77	6				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.0'
Hole Backfilled 9 13 83 - Drilled 10' north of PI 141.

Moderate Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

NOTE NO AP 83-225 — DWG NO GTF-CON 8051

80

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-226

Feature Great Falls - Conrad 230 kV Transmission Line — State Montana
Station 2261+71.44 ahead, 2304+34.72 right — Coordinates N 270,857 E 1,395,846 — Ground Elevation 3868 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 9/13/83 — Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION. GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL	0.5	SPT N = 31	4	0.0' - 0.5' TOPSOIL - about 10% medium gravel, 20% medium to coarse sand, 50% low plasticity fines, 20% organic material, Maximum Size 2", Color Brown, Moisture dry.		0	0
	6.0	SPT N = 31	8	0.5' - 6.0' SANDY CLAY WITH GRAVEL - about 5% medium gravel, 20% fine to medium sand, 75% medium plasticity fines, Maximum Size 1" subrounded to subangular, Color Brown, Moisture slightly moist, hard, alluvial, (CL).			
		SPT N=50/.5	7	6.0' - 20.0' CLAYSTONE SHALE - soft rock, thinly bedded, fractured, slightly weathered, oxides, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist			
	20.0	SPT N=81.5	13				

REMARKS Drilled by Northern Engineering and Testing, Inc
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.0'
Hole Backfilled 9/13/83

Moderate Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

NOTE NO AP 83-226 — DWG NO GTF-CON 8052

81

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-227

Feature Great Falls - Conrad 230 kV Transmission Line — State Montana
Station 2296+53.63, 5' left — Coordinates N 270,259 E 1,395,361 — Ground Elevation 3849 — Approx Dimensions 18" Auger
Date & Depth to Water Not Encountered — Method of Excavation Power Pole Auger — Date 9/28/83 — Logged by D. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOL	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION. GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL	0.4	S. Sack	13	0.0' - 0.4' TOPSOIL - about 10% fine sand, 70% low plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist.			
	6.5	S. Sack	10	0.4' - 6.5' SILTY CLAY - about 10% gravel, 5% sand, 85% medium plasticity fines, Maximum Size ¾", Color Brown, Moisture moist, very stiff, (CL).		0	0
		S. Sack	14	6.5' - 20.0' SHALE CLAYSTONE - soft rock, Colorado Group, recovered as about 5% fine sand, 95' high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist.		0	0
	20.0	S Sack	10				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Power Pole Auger - Truck-mounted, Highway (Model HCAM5) with 18" auger.
After auger removed, hole stayed open.
Required Depth = 20.0', 9/28/83.
Hole Backfilled 9'28/83

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

NOTE NO AP 83-227 — DWG NO GTF-CON 8053

82

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-228

Feature Great Falls - Conrad 230 kV Transmission Line — State Montana
Station 2254+13.40 — Coordinates N 270,092 E 1,395,833 — Ground Elevation 3873 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 9/16/83 — Logged by P. O'Rourke

UNIFIED SOIL CLASSIFICATION SYMBOL	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION. GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL	0.5	SPT N = 48	8	0.0' - 0.5' TOPSOIL - about 80% medium to fine sand, 15% low plasticity fines, 5% organic material, Maximum Size medium sand, Color Brown, Moisture dry, loose.		0	0
	2.5	SPT N=50/.4	14	0.5' - 2.5' SANDY CLAY - about 30% medium to fine sand, 70% low plasticity fines, Maximum Size medium sand, Color Light Brown, Moisture dry, medium dense, alluvial, (CL).			
		SPT N=50/.4	11	2.5' - 20.2' CLAYSTONE SHALE - soft rock, thinly bedded, slightly weathered, some gypsum and selenite, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist.			
	20.2	SPT N=50/.2	9				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.2'
Hole Backfilled 9/16/83 - Drilled 10' south of PI 142.

Moderate Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

NOTE NO AP 83-228 — DWG NO GTF-CON 8054

83

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-230

Feature Great Falls - Conrad 230 kV Transmission Line — State Montana
Station 2208+22, 310 right — Coordinates N 270,238 E 1,400,432 — Ground Elevation 3972 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 9/14/83 — Logged by P. O'Rourke

UNIFIED SOIL CLASSIFICATION SYMBOL	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION. GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
GW-GM	0.4	SPT N = 72	13	0.0' - 0.4' TOPSOIL - about 10% fine sand, 80% low plasticity fines, 10% organic material, Maximum Size fine sand, Color Light Brown, Moisture dry.		0	0
	8.0	SPT N = 34	11	0.4' - 8.0' SANDY GRAVEL - about 50% coarse to fine gravel, 40' medium to fine sand, 10% non-plastic fines, Maximum Size 3" angular to subrounded, Color Medium Tan to Gray, Moisture dry, terrace deposit (GW-GM).			
		SPT N = 90	7	8.0' - 20.5' CLAYSTONE SHALE - soft rock, blocky, partially weathered, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist.			
	20.5	SPT N = 54	7				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.5'
Hole Backfilled 9/14/83 - Drilled 10' west of PI 144.

Moderate Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

NOTE NO AP 83-230 — DWG NO GTF-CON 8055

84

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-235

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Station 2172+16, 75' right — Coordinates N 269,871 E 1,404,027 — Ground Elevation 3970 — Approx Dimensions 9" Auger

Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 9/14/83 — Logged by P. O'Rourke

UNIFIED SOIL CLASSIFICATION SYMBOL (TEXT)	(GRAPHIC)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION. GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3"-5" INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
		0.9			0.0' - 0.9' TOPSOIL - about 5% medium gravel, 10% fine sand, 80% non-plastic fines, 5% organic material, Maximum Size 1/2" subrounded, Color Light Brown, Moisture dry.			
GW			SPT N=50/.4	3	0.9' - 5.0' SANDY GRAVEL - about 5% cobbles, 55% coarse to fine gravel, 35% medium to fine sand, 5% non-plastic fines, Maximum Size 3½", Color Tan to Gray, Moisture dry, terrace deposit, (GW).		5	0
		5.0	SPT N = 40	7				
			SPT N = 58	11	5.0' - 20.0' CLAYSTONE SHALE - soft rock, blocky, partially weathered, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture dry.			
		20.0	SPT N = 52	13				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.0'
Hole Backfilled 9/14/83 - Drilled 10' east of PI 145.

Moderate Drilling

HOLE NO AP 83-235 — DWG NO GTF-CON B056

NOTE: Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

85

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Hole No PR 83-240 — Coordinates N 269,599 E 1,409,357 — Ground Elevation 3927

Depth and Elev of Water Level* Not Encountered — Location Station 2118+78.17 — Total Depth 20.3 feet

*Date Measured 9/14/83 — Date Begun 9/14/83 — Finished 9/14/83 — Logged by P. O'Rourke — Reviewed by A. Stilley

NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50
Rotary, Truck-mounted

Driller
B. Neff

Method:
Drilled with diameter hol[low] stem augers. Drive sample (SPT) taken at the inter[vals] listed below

Drive Sample Intervals, Feet
3.0 - 4.5
8.0 - 8.8
13.0 - 13.3
20.0 - 20.3

Progress Report
3.0-20.3' 9/14/83
After augers were removed, hole remained open
Moderate to difficult drilling

Hole Backfilled 9/14/83

CORE RECOVERY-%	BLOWS/FOOT	WATER CONTENT-%	SAMPLES FOR TESTING	DEPTH (FT.)	GRAPHIC LOG	PENETRATION RESISTANCE Blows per Foot	CLASSIFICATION AND DESCRIPTION OF MATERIAL
				0.4	CL		0.0'-0.4' TOPSOIL - about 90% fine sand, 5% low plasticity fines, 5% organic material, Maximum Size fine sand, Color Light Brown, Moisture dry.
41	50	10	SPT			50	
			SPT	10			0.4' - 20.3' CLAYSTONE SHALE - soft rock, finely bedded, some gypsum and selenite, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Dark Brown, Moisture dry
32	50/.3	7				167	
			SPT				
5	50/.3	7				167	
			SPT	20.3			
1	50/.3	-				167	

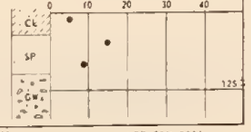
Weight of Hammer 140 lb — Height of Drop 30 in.

EXPLANATION

BLOWS FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated thus, 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type, with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot, as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125.



FEATURE Great Falls-Conrad 230 KV Transmission Line — STATE Montana — HOLE NO PR 83-240 — DWG NO GTF-CON B055

86

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Hole No PR 83-245 — Coordinates N 274,089 E 1,415,937 — Ground Elevation 3840

Depth and Elev of Water Level* Not Encountered — Location Station 2039+11.12, 10' right — Total Depth 20.0 feet

*Date Measured 9/15/83 — Date Begun 9/14 83 — Finished 9/15/83 — Logged by P. O'Rourke — Reviewed by A. Stilley

NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50
Rotary, Truck-mounted

Driller
B. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below

Drive Sample Intervals, Feet
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0

Progress Report
0.0-20.0' 9/15/83
After augers were removed, hole remained open.
Moderate drilling

Hole Backfilled 9/15/83

Drilled 10 feet north of PI 149

CORE RECOVERY-%	BLOWS/FOOT	WATER CONTENT-%	SAMPLES FOR TESTING	DEPTH (FT.)	GRAPHIC LOG	PENETRATION RESISTANCE Blows per Foot	CLASSIFICATION AND DESCRIPTION OF MATERIAL
				0.4	CL		0.0'-0.4' TOPSOIL - about 80% fine to medium sand, 15% low plasticity fines, 5% organic material, Maximum Size medium sand, Color Brown, Moisture dry
40	44	4	SPT	2.5		100	0.4'-2.5' SILTY CLAY - about 15% fine to medium sand, 80% medium plasticity fines, 5% organic material, Maximum Size medium sand, Color Brown, Moisture dry, soft, (CL).
95	46	14	SPT	10			
97	90	19	SPT			90	2.5'-20.0' CLAYSTONE SHALE - soft rock, thinly bedded, sandstone lenses, partially weathered, Colorado Group, recovered as about 10 fine sand, 90 high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist.
85	50/.5	13	SPT	20.0		100	

Weight of Hammer 140 lb — Height of Drop 30 in.

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated thus 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type, with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot, as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125.

FEATURE Great Falls-Conrad 230 KV Transmission Line — STATE Montana — HOLE NO PR 83-245 — DWG NO GTF-CON B054

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-250

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 2002+63, 105' right — Coordinates N 274,080 E 1,419,592 — Ground Elevation 3892 — Approx Dimensions 18" Auger
Date & Depth to Water Not Encountered — Method of Excavation Power Pole Auger — Date 9/29/83 — Logged By O. Syrora

Unified Soil Classification Symbol Letter	Graphic	Depth (Feet)	Size and Type of Sample Taken	In Place Moisture (%)	Classification and Description of Material (See Chart—"Unified Soil Classification" Give Geologic and In Place Description for Foundation Investigations)	Percent Moisture	Percentage by Volume of 3-5 Inch	Percentage by Volume of Plus 5-Inch
CL		0.4			0.0' - 0.4' TOPSOIL - about 10% fine sand, 70% low plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist			
		5.5	S. Sack	10	0.4' - 5.5' SILTY CLAY WITH GRAVEL - about 15% gravel, 10% sand, 75% medium plasticity fines, Maximum Size 1" subangular, Color Brown, Moisture slightly moist to moist, stiff, (CL).		0	0
			S. Sack	10				
			S. Sack	10	5.5' - 20.0' SHALE CLAYSTONE - soft rock, Colorado Group, recovered as about 5% fine sand, 95% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist		0	0
			S. Sack	10				
		20.0	S. Sack	13				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger.
After auger removed, hole stayed open.
Required Depth = 20.0', 9/29/83
Hole Backfilled 9/29/83 - Drilled 8' north of PI 150.

HOLE NO AP 83-250 — DWG NO GTF-CON 8059

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-255

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 1950+40, 125' right — Coordinates N 273,948 E 1,424,812 — Ground Elevation 3782 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 9/15/83 — Logged By P. O'Rourke

Unified Soil Classification Symbol Letter	Graphic	Depth (Feet)	Size and Type of Sample Taken	In Place Moisture (%)	Classification and Description of Material (See Chart—"Unified Soil Classification" Give Geologic and In Place Description for Foundation Investigations)	Percent Moisture	Percentage by Volume of 3-5 Inch	Percentage by Volume of Plus 5-Inch
CH		0.3			0.0' - 0.3' TOPSOIL - about 80% fine to medium sand, 10% low plasticity fines, 10% organic material, Maximum Size medium sand, Color Brown, Moisture dry.		0	0
			SPT N = 16	3				
		4.0			0.3' - 4.0' FAT CLAY - about 20% fine sand, 80% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture dry, (CH)			
			SPT N = 34	10	4.0' - 21.0' CLAYSTONE SHALE - soft rock, finely bedded, partially weathered, Colorado Group, recovered as about 15% fine sand, 85% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist			
			SPT N=50/.3	4				
		21.0	SPT N = 62	16				

REMARKS: Drilled by Northern Engineering and Testing, Inc. — Moderate Drilling
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 21.0'
Hole Backfilled 9/15/83 - Drilled 10' south of PI 151.

HOLE NO AP 83-255 — DWG NO GTF-CON 8060

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Hole No PR 83-260 — Coordinates N 273,647 E 1,430,878 — Ground Elevation 3705
Depth and Elev of Water Level* 5.0' — Location Station 1889+66.57, centerline — Total Depth 20.0 feet
*Date Measured 9/16/83 — Date Begun 9/16/83 — Finished 9/18/83 — Logged by P. O'Rourke — Reviewed by A Stilley

NOTES
Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50
Rotary, Truck-mounted

Driller
B. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below.

Drive Sample Intervals, Feet
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0

Progress Report
0.0-20.0' 9/16/83
After augers were removed, hole remained open. Installed 20.0' of 1¼" pvc pipe as observation well. Easy drilling

Hole Backfilled 9/18/83

Drilled 20' west of PI 425.

Core Recovery %	Blows/Foot	Water Content %	Samples for Testing	Depth (Ft)	Graphic Log	Penetration Resistance Blows per Foot (Weight of Hammer 140 lb, Height of Drop 30 in)	Classification and Description of Material
55	7	16	SPT	0.5	CL		0.0'-0.5' TOPSOIL - about 5% fine sand, 90% medium plasticity fines, 5% organic material, Maximum Size fine sand, Color Brown, Moisture dry, loose.
				5.0			
20	36	21	SPT	10	CL		0.5'-5.0' SILTY CLAY - about 5% fine sand, 95% low plasticity fines, Maximum Size fine sand, Color Brown, Moisture wet, firm, (CL).
25	12	10	SPT	15.0			5.0'-15.0' GRAVELLY CLAY - about 30% fine to medium gravel, 10% fine sand, 60% medium plasticity fines, Maximum Size 1" angular to subrounded, Color Dark Brown, Moisture saturated, dense, (CL).
100	16	24	SPT	20.0			15.0'-20.0' CLAYSTONE SHALE - soft rock, blocky, Colorado Group, recovered as about 10 fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Dark Brown, Moisture moist.

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated thus 50 - 4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines max size 1 4 inch, lum, moist, gray, uncemented (SP)

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 50, open circle with extrapolated value 125.

FEATURE Great Falls-Conrad 230 KV Transmission Line — STATE Montana — HOLE NO PR 83-260 — DWG NO GTF-CON 8061

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Hole No PR 83-265 — Coordinates N. 273,823 E. 1,431,440 — Ground Elevation 3703
Depth and Elev of Water Level* 5.5' — Location Station 1883+46.28, 15' west — Total Depth 20.0 feet
*Date Measured 9/16/83 — Date Begun 9/16/83 — Finished 9/16/83 — Logged by W. Henning — Reviewed by A. Stilley

NOTES
Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50
Rotary, Truck-mounted

Driller
B. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below.

Drive Sample Intervals, Feet
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0

Progress Report
0.0-20.0' 9/16/83
After augers were removed, hole remained open. Installed 20.0' of 1¼" diameter pvc pipe as observation well. Easy drilling.

Hole Backfilled 9/16/83

Hole drilled 15' west of PI 422.

Core Recovery %	Blows/Foot	Water Content %	Samples for Testing	Depth (Ft)	Graphic Log	Penetration Resistance Blows per Foot (Weight of Hammer 140 lb, Height of Drop 30 in)	Classification and Description of Material
				0.4			0.0' - 0.4' TOPSOIL - about 20% fine sand, 80% medium plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist
20	8	10	SPT	5.5	CL		0.4' - 9.5' GRAVELLY CLAY - about 30% medium gravel, 20% fine to medium sand, 50% medium plasticity fines, Maximum Size 2" angular to subangular, Color Brown, Moisture moist, firm, alluvial, (CL).
67	21	13	SPT	9.5	CH		9.5' - 15.0' SILTY CLAY WITH GRAVEL about 5% medium gravel, 20% fine to coarse sand, 75% high plasticity fines, Maximum Size 1/2" subrounded, Color Black, Moisture moist, very stiff, reworked shale (CH).
87	13	25	SPT	15.0			15.0' - 20.0' SHALE CLAYSTONE - soft rock, thinly bedded, some blocky zones, slightly fractured, oxides, selenite fragments, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Black, Moisture slightly moist
93	40	17	SPT	20.0			

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated thus 50 - 8 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines max size 1 4 inch, lum, moist, gray, uncemented (SP)

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 50, open circle with extrapolated value 125.

FEATURE Great Falls-Conrad 230 KV Transmission Line — STATE Montana — HOLE NO PR 83-265 — DWG NO. GTF-CON 8062

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-270

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Station 1843+90, 100' left — Coordinates N 273,685 E 1,435,407 — Ground Elevation 3691 — Approx Dimensions 9" Auger

Date & Depth to Water 7.6 feet, 9/20/83 — Method of Excavation Mobile B-50 — Date 9/20/83 — Logged by K. Munski

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	UNIFIED SOIL CLASSIFICATION SYMBOL GROUPSYM	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION. GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
GP		1.2					0	0
CL			SPT N = 10	25	0.0' - 1.2' SANDY GRAVEL FILL - about 50% gravel, 30% sand, 20% low plasticity fines, Maximum Size 2", Color Brown, Moisture slightly moist, medium dense, road surfacing, (GP).			
		7.6	SPT N = 8	21	1.2' - 12.5' SILTY CLAY - about 10% fine sand, 90% medium plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist to saturated, stiff, (CL).		0	0
		12.5	SPT N = 9	24				
CH					12.5' - 21.5' FAT CLAY - about 10% gravel, 5 fine to coarse sand, 85% high plasticity fines, Maximum 1/2", Color Dark Brown, Moisture moist to saturated, very stiff, (CH).		0	0
		21.5	SPT N = 28	15				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open
Required Depth = 21.5 feet
Hole Backfilled 9/20/83 - Drilled at PI 153.
Moderate Drilling
21.5' of 1½" pvc pipe installed as observation well.

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-270 — DWG NO GTF-CON 8063

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Hole No PR 83-275 — Coordinates N 273,873 E 1,440,517 — Ground Elevation 3692

Depth and Elev. of Water Level* 19.1 feet — Location Station 1792+85, 200' right — Total Depth 20.4 feet

*Date Measured 9/20.83 — Date Begun 9/20/83 — Finished 9/20/83 — Logged by K. Munski — Reviewed by A. Stilley

NOTES
Water losses type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50 Rotary, Truck-mounted

Driller
B. West

Method
Drilled with 9" diameter hollow-stem augers. Drive samples (SPT) taken at the intervals listed below.

Drive Sample Intervals, feet
0.0 - 4.5
6.0 - 9.5
12.0 - 13.5
20.0 - 20.4

Progress Reports
0-21.5' 9/20/83

After augers were removed, hole remained open
Moderate drilling
Installed 20.0' of 1½" pvc pipe as observation well

Hole Backfilled
9/20/83

CORE RECOVERY* %	BLOWS/FOOT	WATER CONTENT* %	SAMPLES FOR TESTING	DEPTH (FT.)	GRAPHIC LOG	CLASSIFICATION AND DESCRIPTION OF MATERIAL
				0.3	CL	0.0'-0.3' TOPSOIL - about 20 fine sand, 70 low plasticity fines, 10 organic material, Maximum Size fine sand, Color Brown, Moisture moist, medium stiff
80	34	19	SPT	6.0		
50	21	14	SPT	10		0.3'-6.0' SILTY CLAY - about 20 fine sand, 80 medium plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, stiff, (CL).
50	84/.5	12	SPT	168		
				19.1		
100	817.4	11	SPT	20.4		6.0'-20.4' SHALE CLAYSTONE - soft rock, thinly bedded, Colorado Group, recovered as about 10% fine sand, 90% highly plastic fines, Maximum Size fine sand, Color Brown, Moisture moist
				30		208
				40		
				50		
				60		
				70		
				80		
				90		

PENETRATION RESISTANCE
Blows per Foot
Weight of Hammer 140 lb
Height of Drop 30 in.
0 10 20 30 40 50

EXPLANATION

BLOWS FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated thus 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on in-place condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1 1/4 inch, (um, moist, gray, uncemented (SP))

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125

FEATURE Great Falls-Conrad 230 KV Transmission Line — STATE Montana — HOLE NO PR 83-275 — DWG NO. GTF CO' 8064

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-280

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Station 1758+17.82, 6' south — Coordinates N 273,591 E 1,443,978 — Ground Elevation 3700 — Approx Dimensions 18" Auger

Date & Depth to Water Not Encountered — Method of Excavation Power Pole Auger — Date 9/29/83 — Logged by O. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	UNIFIED SOIL CLASSIFICATION SYMBOL GROUPSYM	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION. GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL		0.2			0.0' - 0.2' TOPSOIL - about 35% gravel size hard shale fragments, 10% sand, 50% low plasticity fines, 5% organic material, Maximum Size 2" angular, Color Brown, Moisture slightly moist.			
		2.0	S. Sack	9	0.2' - 2.0' SILTY CLAY WITH GRAVEL - about 30% gravel (hard shale fragments), 10% sand, 60% medium plasticity fines, Maximum Size 2" angular, Color Brown, Moisture slightly moist, very stiff, residual soil, (CL).		0	0
			S. Sack	8				
			S. Sack	9	2.0' - 20.0' SHALE CLAYSTONE - soft rock, interbedded with hard shale and sandstone, Colorado Group, recovered as about 5% fine sand, 95% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist.		0	0
		20.0	S. Sack	12				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger.
After auger removed, hole stayed open
Required Depth = 20.0', 9/29/83.
Hole Backfilled 9/29/83 - Drilled 6' south of PI 155.

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-280 — DWG NO GTF-CON 8065

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Hole No PR B3-290 — Coordinates N 275,531 — E 1,461,771 — Ground Elevation 3689

Depth and Elev of Water Level* 20.3 feet — Location Station 1577+28, 175' right — Total Depth 48.8 feet

*Date Measured 9/20/83 — Date Begun 9/20/83 — Finished 9/21/83 — Logged by J. Munski — Reviewed by A. Stilley

NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50
Rotary, Truck-mounted

Driller
S. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive samples (SPT) taken at the intervals listed below.

Drive Sample Intervals, Feet
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
19.5 - 21.0
23.0 - 24.5
28.0 - 29.5
33.0 - 34.5
37.5 - 39.0
42.5 - 44.0
48.5 - 48.8

Progress Report
0-48.8', 9/21/83
Installed 1½" pvc pipe to 48.8' as observation well. After auger removed, hole remained open. Moderate drilling.

Hole Backfilled
9/21/83

CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT)
301	12	13	SPT	0.4
70	5	23	SPT	11.0
50	21	21	SPT	
100	12	24	SPT	20.3
96	12	31	SPT	
100	14	26	SPT	
100	8	32	SPT	
100	8	29	SPT	
100	41	18	SPT	
95	50/.3	20	SPT	48.8

GRAPHIC LOG: CL

PENETRATION RESISTANCE — Blows per Foot — Weight of Hammer 140 lb — Height of Drop 30 in

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.4' TOPSOIL - about 20% fine sand, 70% low to medium plasticity fines, 10% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist.

0.4'-11.0' SILTY CLAY - about 10% fine sand, 90% low to medium plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist, (CL).

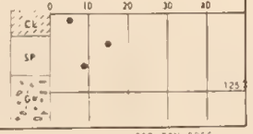
11.0'-48.8' SHALE CLAYSTONE - soft rock, thinly bedded, slightly weathered, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown to Black, Moisture very moist to slightly moist

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration record depth penetrated, thus 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125○.



FEATURE Great Falls-Conrad 230 KV Transmission Line — STATE Montana — HOLE NO PR B3-290 — DWG NO G1F-CON 8066

LOG OF TEST PIT OR AUGER HOLE FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-295

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Station 1563+11.25, 5' left — Coordinates N 275,189 — E 1,463,157 — Ground Elevation 3749 — Approx Dimensions 9" Auger

Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 9/21/83 — Logged by P. O'Rourke

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	GRAPH	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %
SP		0.4		
		2.0	SPT N = 28	10
			SPT N = 44	11
			SPT N = 60	9
		20.9	SPT 11=50/.4	7

CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION FOR FOUNDATION INVESTIGATIONS; GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)

0.0 - 0.4' TOPSOIL - about 5% cobbles, gravel, 80% fine sand, 10% non-plastic fines, 5% organic material, Maximum Size 8", Color Light Brown, Moisture dry, loose.

0.4' - 2.0' GRAVELLY SAND - about 15% medium gravel, 80% medium to fine sand, 5% non-plastic fines, Maximum Size 3/4" subangular to subrounded, Color Tan to Gray, Moisture dry, loose alluvial, (SP).

2.0' - 20.9' SHALE CLAYSTONE - soft rock, thinly bedded, oxides, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray Brown, Moisture moist to slightly moist

PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
	0	0

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.9 feet.
Hole Backfilled 9/21/83 - Drilled 10' east of PI 160.

Moderate Drilling

NOTE: Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-295 — DWG NO G1F-CON 8067

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Hole No PR B3-300 — Coordinates N 275,680 — E 1,466,517 — Ground Elevation 3728

Depth and Elev of Water Level* Not Encountered — Location Station 1526+48.49, 470' right — Total Depth 20.3 feet

*Date Measured 9/22/83 — Date Begun 9/22/83 — Finished 9/22/83 — Logged by P. O'Rourke — Reviewed by A. Stilley

NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50
Rotary, Truck-mounted

Driller
E. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive samples (SPT) taken at the intervals listed below

Drive Sample Intervals, Feet
3.0 - 4.5
8.0 - 9.3
13.0 - 13.4
20.0 - 20.3

Progress Report
0-20.3', 9/22/83
After augers were removed, hole remained open. Moderate drilling

Hole Backfilled
9/22/83

CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT)
100	64	17	SPT	0.5
100	50/.3	13	SPT	1.5
20	50/.4	7	SPT	10
10	50/.3	5	SPT	20.3

GRAPHIC LOG: CL

PENETRATION RESISTANCE — Blows per Foot — Weight of Hammer 140 lb — Height of Drop 30 in

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 60% fine sand, 20% medium plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist.

0.5 -1.5 CLAYEY SAND WITH GRAVEL about 10% medium gravel, 60% fine sand, 30% low plasticity fines, Maximum Size 1" subrounded, Color Brown, Moisture dry, loose, (SC).

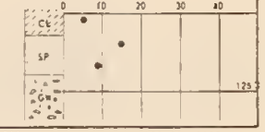
1.5'-20.3' SHALE CLAYSTONE - soft rock, thinly bedded, weathered, Colorado Group, recovered as about 10% fine sand, 90% medium plasticity fines, Maximum Size fine sand, Color Dark Brown to Black, Moisture slightly moist.

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration record depth penetrated, thus 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot, as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125○.



FEATURE Great Falls-Conrad 230 KV Transmission Line — STATE Montana — HOLE NO PR B3-300 — DWG NO G1F-CON 8068

97

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line State Montana

Hole No PR 83-305 Coordinates N 275,584 E 1,467,351 Ground Elevation 3743

Depth and Elev of Water Level* Not Encountered Location Station 1521+75, 370' right Total Depth 20.2 feet

*Date Measured 9/22/83 Date Begun 9/22/83 Finished 9/22/83 Logged by P. O'Rourke Reviewed by A. Stilley

NOTES
Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50 Rotary, Truck-mounted

Driller
B. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive samples (SPT) taken at the intervals listed below

Drive Sample Intervals, Feet
3.0 - 4.5
8.0 - 9.4
13.0 - 13.4
20.0 - 20.2

Progress Report
0-20.2', 9/22/83
After augers were removed, hole remained open. Moderate drilling

Hole Backfilled
9/22/83

CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT)
40	42	9	SPT	0.5
30	50/.4	11	SPT	10
30	50/.4	9	COT	
0	50/.2		SPT	20.2

GRAPHIC LOG

PENETRATION RESISTANCE
Blows per Foot
Weight of Hammer 140 lb.
Height of Drop 30 in.
0 10 20 30 40 50

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.4' TOPSOIL - about 50% fine sand, 25% low plasticity fines, 25% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist, loose

0.4'-1.5' SANDY CLAY WITH GRAVEL - 10% medium gravel, 40% fine sand, 50% low plasticity fines, Maximum Size 3/4" subangular, Color Light Brown, Moisture dry, loose, (SC-CL).

1.5'-20.2' SHALE CLAYSTONE - soft rock, thinly bedded, weathered, oxides, Colorado Group, recovered as about 20% fine sand, 80% medium plasticity fines, Maximum Size fine sand, Color Dark Brown, Moisture slightly moist

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated thus: 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on in-place condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, damp, moist, gray, uncemented (SP)

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 50, open circle with extrapolated value 125.

FEATURE Great Falls-Conrad 230 kV Transmission Line STATE Montana HOLE NO PR-83-305 DWG NO GTF-CON 8069

98

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-310

Feature Great Falls - Conrad 230 KV Transmission Line State Montana

Station 1472+60, centerline Coordinates N 275,237 E 1,472,207 Ground Elevation 3777 Approx. Dimensions 18" Auger

Date & Depth to Water Not Encountered Method of Excavation Power Pole Auger Date 9/29/83 Logged by O. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOL (LETTER)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION. GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL	0.4			0.0' - 0.4' TOPSOIL - about 10% fine sand, 80% low plasticity fines, 10% organic material. Maximum Size fine sand, Color Brown, Moisture dry to slightly moist.			
	2.0	S. Sack	9	0.4' - 2.0' SILTY CLAY - about 10% gravel, 10% fine sand, 80% medium plasticity fines, Maximum Size 1½" subangular, Color Brown, Moisture slightly moist, stiff, (CL)		0	0
		S. Sack	9	2.0' - 20.0' SHALE CLAYSTONE - soft rock, Colorado Group, recovered as about 5% fine sand, 95% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist.		0	0
		S. Sack	10				
	20.0	S. Sack	11				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger.
After auger removed, hole stayed open.
Required Depth = 20.0', 9/29/83
Hole Backfilled 9/29/83 - Drilled 5' east of PI 162.

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-310 DWG NO GTF-CON 8070

99

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-315

Feature Great Falls - Conrad 230 KV Transmission Line State Montana

Station 1420+32, 40' right Coordinates N 275,130 E 1,477,433 Ground Elevation 3769 Approx. Dimensions 9" Auger

Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 9/22/83 Logged by P. O'Rourke

UNIFIED SOIL CLASSIFICATION SYMBOL (LETTER)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION. GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
	0.4			0.0' - 0.4' TOPSOIL - about 60% fine sand, 30% non-plastic fines, 10% organic material, Maximum Size fine sand, Color Brown, Moisture dry, loose		0	0
CL	2.5	SPT N = 26	12	0.4' - 2.5' SANDY CLAY WITH GRAVEL - about 20% gravel, 30% fine sand, 50% low plasticity fines, Maximum Size 1½" angular, Color Brown, Moisture dry, firm, alluvial, (CL)			
		SPT N = 42	14	2.5' - 20.0' SHALE CLAYSTONE - soft rock, thinly bedded, weathered, gypsum fragments, selenite, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Dark Brown to Black, Moisture slightly moist.			
		SPT N=50/.4	15				
	20.0	SPT N=50/.5	5				

REMARKS Drilled by Northern Engineering and Testing, Inc
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open
Required Depth = 20.0 feet
Hole Backfilled 9/22/83 - Drilled 10' north of PI 163.

Moderate to Difficult Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-315 DWG NO GTF-CON 8071

100

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-320

Feature Great Falls - Conrad 230 KV Transmission Line State Montana

Station 1364+74, 45' right Coordinates N 274,979 E 1,482,988 Ground Elevation 3739 Approx. Dimensions 9" Auger

Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 9/22/83 Logged by P. O'Rourke

UNIFIED SOIL CLASSIFICATION SYMBOL (LETTER)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION. GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
	0.4			0.0' - 0.4' TOPSOIL - about 40% fine sand, 50% non-plastic fines, 10% organic material, Maximum Size fine sand, Color Brown, Moisture dry, loose		0	0
SM	2.5	SPT N = 31	4	0.4' - 2.5' GRAVELLY SAND - about 30% gravel, 50% fine to medium sand, 20% low plasticity fines, Maximum Size 1" subangular, Color Brown, Moisture dry, loose, colluvial, (SM).			
		SPT N = 52	10	2.5' - 17.0' SHALE, CLAYSTONE - soft rock with hard lenses, thinly bedded, some oxides, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Dark Brown to Black, Moisture slightly moist.			
		SPT N=50/.4	4				
	17.0						

REMARKS Drilled by Northern Engineering and Testing, Inc
Mobile Drill, Model B-50, with 9" hollowstem augers used
After augers removed, hole stayed open.
Bottom of hole at 17.0 feet, auger refusal.
Hole Backfilled 9/22/83 - Drilled 10' east of PI 164

Very Difficult Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-320 DWG NO GTF-CON 8072

101

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

Feature: Great Falls - Conrad 230 kV Transmission Line — State: Montana

Hole No: PR 83-325 — Coordinates N: 274,830 — E: 1,485,985 — Ground Elevation: 3728

Depth and Elev of Water Level*: 3.5 feet — Location: Station 1334+73.47, 20' south — Total Depth: 20.9 feet

*Date Measured: 9/22/83 — Date Begun: 9/22/83 — Finished: 9 22 83 — Logged by: P O'Rourke — Reviewed by: A. Stilley

NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By: Northern Engineering and Testing, Inc.

Drill Equipment: Mobile B-50 Rotary, Truck-mounted

Driller: B. Neff

Method: Drilled with 9" diameter hollow-stem augers. Drive samples (SPT) taken at the intervals listed below.

Drive Sample Intervals, feet:
3.0 - 4.5
5.0 - 9.5
13.0 - 14.5
20.0 - 20.9

Progress Report: 0-20.9', 9 22 83. After augers were removed, hole remained open. Moderate drilling. Installed 1" pvc pipe to 20.9' as observation well.

Hole Backfilled: 9/22/83

DEPTH (FT)	CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	GRAPHIC LOG	PENETRATION RESISTANCE Blows per Foot (Weight of Hammer 140 lb, Height of Drop 30 in)	CLASSIFICATION AND DESCRIPTION OF MATERIAL
0.5							
1.0					CL		0.0'-0.4' TOPSOIL - about 40 medium to fine sand, 40 non-plastic fines, 20 organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist.
4.0	100	11	21	CS1	SP-SM		0.4'-1.0' SILTY CLAY - about 10 fine sand, 90 low to medium plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, stiff, (CL).
10	95	35	11	SPT			1.0'-4.0' GRAVELLY SAND - about 30 medium gravel, 60 medium to coarse sand, 10 low plasticity fines, Maximum Size 1" subangular, Color Brown, Moisture wet, medium dense, alluvial, (SP-SM).
	100	77	11	SPT		77	4.0'-20.9' SHALE CLAYSTONE - soft rock, thinly bedded, weathered, selenite fragments, Colorado Group, recovered as about 10 fine sand, 90 high plasticity fines, Maximum Size fine sand, Color Black, Moisture slightly moist
	30	50/.4	9	SPT		125	
20.9							

EXPLANATION

BLOWS/FOOT: Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated, thus, 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION: Describe soil type with emphasis on in-place condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines max size 1 1/4 inch, (fill, moist, clay, uncemented (SP).

PENETRATION RESISTANCE: Plot as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125.

FEATURE: Great Falls-Conrad 230 kV Transmission Line — STATE: Montana — HOLE NO: PR 83-325 — DWG NO: GTF-CON 8073

102

LOG OF TEST PIT OR AUGER HOLE FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No: AP 83-330

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana

Station: 1300+40, 320' left — Coordinates N: 272,216 — E: 1,488,211 — Ground Elevation: 3767 — Approx. Dimensions: 18" Auger

Depth & Depth to Water: Not Encountered — Method of Excavation: Power Pole Auger — Date: 9/29/83 — Logged by: O. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOL (USCS)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (USE ENGR.-UNIFIED SOIL CLASSIFICATION) GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3"-5" IN.	PERCENTAGE BY VOLUME OF PLUS 5 INCH
		S. Sack	10	0.0' - 20.0' SHALE CLAYSTONE - soft rock, Colorado Group, recovered as about 5% fine sand, 95% high plasticity fines, Maximum Size fine sand, Color Dark Gray, Moisture moist		0	0
		S. Sack	10				
		S. Sack	10				
	20.0'	S. Sack	7				

REMARKS: Drilled by Northern Engineering and Testing, Inc
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger
After auger removed, hole stayed open.
Required Depth = 20.0', 10/03/83.
Hole Backfilled 10/03/83 - Drilled 10' northeast of PI 167

NOTE: Unless otherwise indicated, % by volume of 3-5" & plus 5" material is estimated

HOLE NO: AP 83-330 — DWG NO: GTF-CON 8074

103

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana

Hole No: PR 83-335 — Coordinates N: 269,425 — E: 1,491,724 — Ground Elevation: 3699

Depth and Elev of Water Level*: Not Encountered — Location: Station 1255+77, 150' right — Total Depth: 20.0 feet

*Date Measured: 10/24 83 — Date Begun: 10/24/83 — Finished: 10/24/83 — Logged by: W. Henning — Reviewed by: A. Stilley

NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By: Northern Engineering and Testing, Inc

Drill Equipment: Mobile B-50 Rotary, Truck-mounted

Driller: B. Neff

Method: Drilled with 9" diameter hollow-stem augers. Drive samples (SPT) taken at the intervals listed below

Drive Sample Intervals, feet:
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0

Progress Report: 0 - 20.0', 10/24/83. After augers were removed, hole remained open. Moderate drilling.

Hole Backfilled: 10/24/83

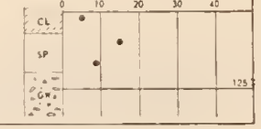
DEPTH (FT)	CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	GRAPHIC LOG	PENETRATION RESISTANCE Blows per Foot (Weight of Hammer 140 lb, Height of Drop 30 in)	CLASSIFICATION AND DESCRIPTION OF MATERIAL
0.5							
	87	42	12	SPT		75	0.0'-0.5' TOPSOIL - about 30 fine sand, 40 low plasticity fines, 30 organic material, Maximum Size fine sand, Color Brown, Moisture dry
10	93	75	12	SPT		90	0.5'-20.0' SHALE CLAYSTONE - soft rock, Blocky, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture slightly moist.
	93	90	12	SPT		100	
	87	50/.5	3	SPT			
20.0							

EXPLANATION

BLOWS/FOOT: Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated, thus, 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION: Describe soil type with emphasis on in-place condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines max size 1 1/4 inch, (fill, moist, clay, uncemented (SP).

PENETRATION RESISTANCE: Plot as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125.



FEATURE: Great Falls-Conrad 230 KV Transmission Line — STATE: Montana — HOLE NO: PR 83-335 — DWG NO: GTF-CON 8075

104

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-336

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 1234+07, centerline Coordinates N 267,797 E 1,493,167 Ground Elevation 3683 Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 10/25/83 Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
		0.5			0.0' - 0.5' TOPSOIL - about 30% fine sand, 50% medium plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist			
			SPT N = 44	15				
CH					0.5' - 20.0' FAT CLAY - about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture slightly moist, very stiff to hard, bentonite layers near bottom of hole, (CH).		0	0
			SPT N = 17	20				
			SPT N = 21	38				
		20.0	SPT N = 15	57				

REMARKS Drilled by Northern Engineering and Testing, Inc
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.0'
Hole Backfilled 10/25/83 - Drilled 140' east of station 1232+67 centerline
Easy Drilling

NOTE Unless otherwise indicated, % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-336 DWG NO GTF-CON 8076

105

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-340

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 1211+99.90, centerline Coordinates N 266,254 E 1,494,743 Ground Elevation 3700 Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 10/25/83 Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
					0.0' - 0.5' TOPSOIL - about 20% fine sand, 60% medium plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist.			
CL			SPT N = 28	11				
		5.0			0.5' - 5.0' SILTY CLAY - about 20% fine sand, 80% medium plasticity fines, Maximum Size fine sand, Color light brown, Moisture slightly moist, very stiff, oxides, salts, alluvial, (CL)		0	0
			SPT N = 72	13				
					5.0' - 21.0' SHALE CLAYSTONE - soft rock, scattered selenite, oxides, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist.			
			SPT N = 47	20				
		21.0	SPT N = 65	19				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 21.0'.
Hole Backfilled 10/25/83 - Drilled 10' west of PI 169.
Moderate Drilling.

NOTE Unless otherwise indicated, % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-340 DWG NO GTF-CON 8077

106

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-341

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 1170+10, centerline Coordinates N 264,372 E 1,498,486 Ground Elevation 3684 Approx Dimensions 18" Auger
Date & Depth to Water 18.0', 10/03/83 Method of Excavation Power Pole Auger Date 10/03/83 Logged by D. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
		0.4			0.0' - 0.4' TOPSOIL - about 5% gravel, 10% sand, 70% low plasticity fines, 15% organic material, Maximum Size 1" subrounded, Color Brown, Moisture dry to slightly moist			
			S Sack	12				
CL					0.4' - 11.0' SILTY CLAY - about 10% sand, 90% medium plasticity fines, Maximum Size coarse sand, Color Brown, Moisture slightly moist to very moist, (CL).		0	0
			S Sack	24				
		11.0			11.0' - 20.0' SHALE CLAYSTONE - soft rock, Colorado Group, recovered as about 5% fine sand, 95% high plasticity fines, Maximum Size fine sand, Color Dark Brown, Moisture moist to wet		0	0
			S Sack	25				
		18.0						
		20.0	S Sack	29				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger.
After auger removed, hole stayed open
Required Depth = 20.0', 10/03/83.
Hole Backfilled 10/03/83 - Drilled 20' southeast of station 1170+30
20' of 13" pvc pipe installed as observation well.

NOTE Unless otherwise indicated, % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-341 DWG NO GTF-CON 8078

107

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 kV Transmission Line State Montana

Hole No PR 83-345 Coordinates N 262,269 E 1,502,291 Ground Elevation 3679
Depth and Elev of Water Level* 21.0' Location Station 1126+65, 170' left Total Depth 34.5 feet
*Date Measured 10/25/83 Date Begun 10/25/83 Finished 10/25/83 Logged by W. Henning Reviewed by A. Stilley

NOTES
Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc

Drill Equipment
Mobile B-50 Rotary, Truck-mounted.

Driller
B. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive samples (SPT) taken at the intervals listed below

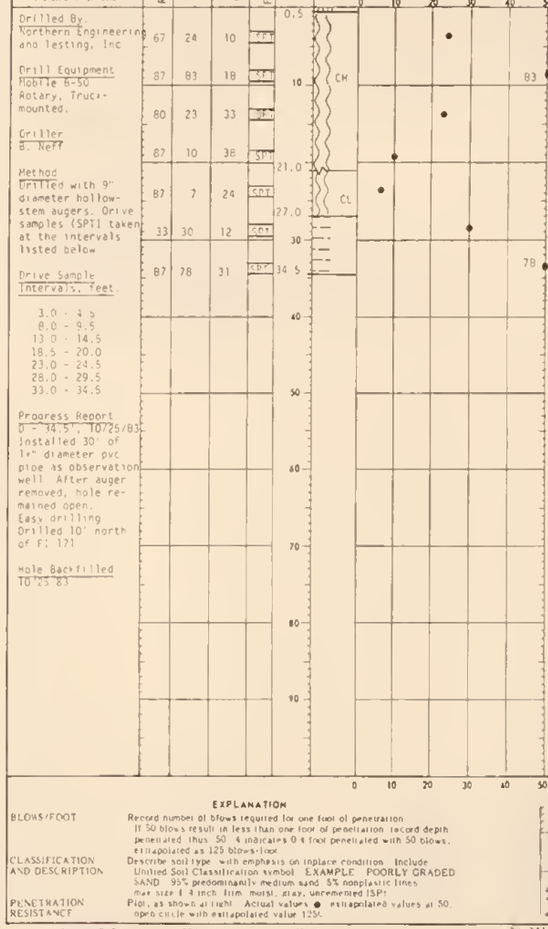
Drive Sample Intervals, feet.
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0
23.0 - 24.5
28.0 - 29.5
33.0 - 34.5

Progress Report
0' - 34.5', 10/25/83
Installed 30' of 14" diameter pvc pipe as observation well. After auger removed, hole remained open.
Easy drilling
Drilled 10' north of PI 171

Hole Backfilled 10/25/83

CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING
67	24	10	SPT
87	83	18	SPT
80	23	33	SPT
87	10	38	SPT
87	7	24	SPT
33	30	12	SPT
87	78	31	SPT

PENETRATION RESISTANCE
Blows per Foot
Weight of Hammer 140 lb
Height of Drop 30 in



CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist.

0.5' - 21.0' FAT CLAY - about 20% fine sand, 80% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture slightly moist to moist, very stiff to hard, alluvial, (CH).

21.0'-27.0' SANDY CLAY - about 30% fine to medium sand, 70% medium plasticity fines, Maximum Size medium sand, Color Brown, Moisture moist, soft to stiff, oxides, alluvial, (CL).

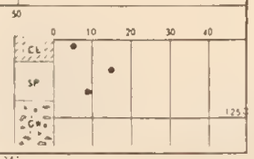
27.0'-34.5' SHALE CLAYSTONE - soft rock, selenite, oxides, scattered bentonite fragments, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture moist

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated, thus 50/.4 indicates 0.4 foot penetrated with 50 blows, extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot, as shown at right. Actual values ●, extrapolated values at 50, open circle with extrapolated value 125.



FEATURE Great Falls-Conrad 230 kV Transmission Line STATE Montana HOLE NO PR 83-345 DWG NO GTF-CON 8079

108

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 kV Transmission Line — State Montana

Hole No PR 83-350 — Coordinates N 258,496 E 1,510,154 — Ground Elevation 3676

Depth and Elev of Water Level* Not Encountered — Location Station 1039+37.69 — Total Depth 20.0 feet

*Date Measured 10/25/83 — Date Begun 10/25/83 — Finished 10/25/83 — Logged by W. Henning — Reviewed by A. Stilley

NOTE: Water losses, type and size of hole drilling method and conditions, Caving and other information

Drilled By Northern Engineering and Testing, Inc.

Drilling Equipment Mobile B-50 Rotary, Truck-mounted.

Driller E. Neff

Method Drilled with 9" diameter hollow stem augers. Drive samples (SPT) taken at the intervals listed below

Drive Sample Intervals, Feet

3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0

Progress Report 20 ft., 10/25/83 After augers were removed, hole remained open. Moderate drilling. Drilled 10' south of PI 173

Hole Backfilled 10/25/83

CORE RECOVERY*	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT.)	GRAPHIC LOG
87	30	23	SPT	0.5	
93	15	30	SPT	10	CH
93	12	42	SPT		
87	15	24	SPT	20.0	

PENETRATION RESISTANCE (Blows per Foot)
Weight of Hammer 140 lb
Height of Drop 30 in

0 10 20 30 40 50

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 30% fine sand, 50% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist.

0.5'-20.0' FAT CLAY - about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, hard to stiff, lacustrine, (CH).

EXPLANATION

RECORD/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated, thus: 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on in-place condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND: 95% predominantly medium sand; 5% nonplastic fines; max size 1/4 inch; dim; moist; gray; uncemented (SP)

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125

FEATURE Great Falls, Conrad 230 kV Transmission Line — STATE Montana — HOLE NO PR 83-350 — DWG NO GTF-CON 8085

109

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-355

Feature Great Falls - Conrad 230 kV Transmission Line — State Montana

Station 1012+37.54, 90' right — Coordinates N 255,794 E 1,510,157 — Ground Elevation 3694 — Approx. Dimensions 9" Auger

Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 10/25/83 — Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART - UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL	0.5	SPT N = 15	15	0.0' - 0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture moist		0	0
	7.0	SPT N = 22	16	0.5' - 7.0' SILTY CLAY FILL - about 5% fine gravel, 20% fine sand, 75% medium plasticity fines, Maximum Size 1/4", Color Brown, Moisture slightly moist, stiff, road fill, (CL)			
		SPT N = 5	9				
		SPT N-50/ 5					
	20.0	SPT N-50/ 7	7	7.0' - 20.0' SHALE CLAYSTONE - soft rock, layered, oxides, selenite, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture slightly moist			

REMARKS: Drilled by Northern Engineering and Testing, Inc
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open
Required Depth - 20.0'
Hole Backfilled 10/25/83 - Drilled 15' south of PI 174

Moderate Drilling

NOTE: Unless otherwise indicated % by column of 3-5" & plus 5" material is estimated

HOLE NO AP 83-355 — DWG NO GTF-CON 8081

110

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-360

Feature Great Falls - Conrad 230 kV Transmission Line — State Montana

Station 958+50, 45' right — Coordinates N 250,612 E 1,509,939 — Ground Elevation 3753 — Approx. Dimensions 9" Auger

Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 10/25/83 — Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART - UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL	0.5	SPT N = 37		0.0' - 0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist		0	0
	2.5	SPT N-50/ 3	11	0.5 - 2.5' SILTY CLAY - about 20% fine sand, 80% medium plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist, very stiff, (CL).			
	10.0			2.5' - 10.0' SHALE CLAYSTONE - soft rock, layered, oxides, selenite, hard layers, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture slightly moist			

Auger refusal at 10.0' in hard shale

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used
After augers removed, hole stayed open.
Auger refusal at 10.0'
Hole Backfilled 10/25/83 - Drilled 10' south of PI 175.

Moderate to Hard Drilling

NOTE: Unless otherwise indicated % by column of 3-5" & plus 5" material is estimated

HOLE NO AP 83-360 — DWG NO GTF-CON 8082

111

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-361

Feature Great Falls - Conrad 230 kV Transmission Line — State Montana

Station 932+09, centerline — Coordinates N 247,774 E 1,509,809 — Ground Elevation 3757 — Approx. Dimensions 18" Auger

Date & Depth to Water Not Encountered — Method of Excavation Power Pole Auger — Date 10/03/83 — Logged by D. Syxora

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART - UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL	0.4			0.0' - 0.4' TOPSOIL - about 10% gravel size sandstone fragments, 5% sand, 70% low plasticity fines, 15% organic material, Maximum Size 1" subrounded, Color Brown, Moisture dry to slightly moist			
	2.5	S Sack	1	0.4' - 2.5' SILTY CLAY - about 5% fine sand, 95% fine to medium plasticity, Maximum Size fine sand, Color Brown, Moisture moist, (CL)			
	4.0			2.5' - 4.0' SHALE CLAYSTONE - soft rock, Colorado Group, recovered as about 5% fine sand, 95% high plasticity fines, Maximum Size fine sand, Color Gray Brown, Moisture moist		0	0
	4.5			4.0' - 4.5' SANDSTONE - hard, Colorado Group, recovered as about 85% fine sand, 15% non-plastic fines, Maximum Size fine sand, Color Brown, Moisture dry		0	0

Auger refusal at 4.5' in hard sandstone

REMARKS: Drilled by Northern Engineering and Testing, Inc
Power Pole Auger - Truck-mounted Highway Mode (HFAMS) with 18" auger
After auger removed, hole stayed open
Auger refusal at 4.5 feet in hard sandstone.
Hole Backfilled 10/03/83

NOTE: Unless otherwise indicated % by column of 3-5" & plus 5" material is estimated

HOLE NO AP 83-361 — DWG NO GTF-CON 8083

112

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-365

Feature Great Falls - Conrad 230 kV Transmission Line — State Montana

Station 905+32, 30' left — Coordinates N 245,100 E 1,509,692 — Ground Elevation 3800 — Approx. Dimensions 9" Auger

Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 10/25/83 — Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART - UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL	0.5			0.0 - 0.5' TOPSOIL - about 10% fine gravel, 20% fine sand, 50% high plasticity fines, 20% organic material, Maximum Size 1/4", Color Brown, Moisture slightly moist		0	0
	3.0	SPT N = 20	8	0.5 - 3.0' SILTY CLAY - about 30% fine sand, 70% medium plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, very stiff, (CL)			
	10.5	SPT N-50/ 7	10	3.0' - 10.5' SHALE CLAYSTONE - soft rock, thinly bedded, selenite, oxides, hard layers, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture slightly moist			

Auger refusal at 10.5' in hard shale

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used
After augers removed, hole stayed open.
Auger refusal at 10.5'.
Hole Backfilled 10/25/83 - Drilled 5' south of PI 176.

Hard Drilling

NOTE: Unless otherwise indicated % by column of 3-5" & plus 5" material is estimated

HOLE NO AP 83-365 — DWG NO GTF-CON 8084

113

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-370

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 851+73, centerline Coordinates N 239,743 E 1,509,550 Ground Elevation 3832 Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 10/26/83 Logged By W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—"UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL		0.5			0.0' - 0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist.		0	0
		2.0	SPT N = 26	10	0.5' - 2.0' SILTY CLAY - about 5% fine gravel, 25% fine to medium sand, 70% medium plasticity fines, Maximum Size 1/4", Color Brown, Moisture slightly moist, very stiff, alluvial, (CL).			
			SPT N=50/.4	8				
					2.0' - 20.4' SHALE CLAYSTONE - soft rock, thinly bedded, oxides, selenite, hard layers, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist			
			SPT N=50/.5	17				
		20.4	SPT N=50/.4	10				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open
Required Depth = 20.4'
Hole Backfilled 10/26/83 - Drilled 25' east of PI 177.
Hard Drilling.

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-370 DWG NO GTF-CON 8085

115

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-390

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 662+58.27, 8' right Coordinates N 228,070 E 1,520,911 Ground Elevation 3619 Approx Dimensions 18" Auger
Date & Depth to Water Not Encountered Method of Excavation Power Pole Auger Date 10/04/83 Logged By O. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—"UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
		0.2			0.0' - 0.2' TOPSOIL - about 10% gravel size sandstone fragments, 20% fine sand, 60% low plasticity fines, 10% organic material, Maximum Size 1" angular, Color Brown, Moisture slightly moist.			
SM			S. Sack	5	0.2' - 6.0' SILTY SAND - about 5 cobbles, 20% gravel size sandstone fragments, 50% fine sand, 25% non-plastic fines, Maximum Size 3½" angular, Color Light Brown, Moisture slightly moist, medium dense to dense, (SM).		5	0
		6.0						
CL		7.5	S. Sack	4	6.0' - 7.5' SANDY CLAY - about 20% gravel size sandstone fragments, 20% sand, 60% medium plasticity fines, Maximum Size 3" angular, Color Brown, Moisture slightly moist, stiff, (CL).		0	0
		8.0			7.5' - 8.0' SANDSTONE - hard rock, Colorado Group, recovered as about 75% fine grained sand, 25% non-plastic fines, Maximum Size fine sand, Color Brown, Moisture slightly moist.			
					Auger refusal at 8.0' in hard sandstone.			

REMARKS Drilled by Northern Engineering and Testing, Inc.
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger.
After auger removed, hole stayed open.
Auger refusal at 8.0 feet in hard sandstone
Hole Backfilled 10/04/83 - Drilled 8' north of PI 181.

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-390 DWG NO GTF-CON 8087

117

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-395

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 633+56 - 15' Right Coordinates N 228,023 E 1,523,812 Ground Elevation 3639 Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 10/26/83 Logged By W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—"UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
CL		0.5			0.0' - 0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture moist		0	0
		3.0	SPT N = 59	14	0.5' - 3.0' SILTY CLAY - about 5% medium gravel, 20% fine to medium sand, 75% medium plasticity fines, Maximum Size 1/2" angular, Color Brown, Moisture moist, very stiff, (CL).			
			SPT N=50/.3	11	3.0' - 20.8' SHALE CLAYSTONE - soft rock, thinly bedded, selenite, oxides, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture slightly moist.			
			SPT N=50/.5	11				
		20.8	SPT N=50/.3	12				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used
After augers removed, hole stayed open.
Required Depth = 20.8'
Hole Backfilled 10/26/83 - Drilled at station 633+56, 15' right of centerline.
Moderate Drilling

NOTE Unless otherwise indicated % by volume of 1-5" & plus 5" material is estimated

HOLE NO AP 83-395 DWG NO GTF-CON 8089

114

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-375

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 806+44, centerline Coordinates N 235,217 E 1,509,404 Ground Elevation 3841 Approx Dimensions 18" Auger
Date & Depth to Water Not Encountered Method of Excavation Power Pole Auger Date 10/03/83 Logged By D. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—"UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
		0.4			0.0' - 0.4' TOPSOIL - about 20% cobble and gravel size sandstone fragments, 10% sand, 60% low plasticity fines, 10% organic material, Maximum Size 2" subangular (broken caprock), Color Brown, Moisture slightly moist			
CL			S. Sack	8	0.4' - 7.0' SILTY CLAY - about 5% gravel size sandstone fragments, 20% fine to medium sand, 75% low to medium plasticity fines, Maximum Size 1/2" subangular, Color Brown, Moisture moist, (CL).		0	0
		7.0						
		7.5			7.0' - 7.5' SANDSTONE - Hard rock, Colorado Group, recovered as about 75% fine to medium sand, 25% non-plastic fines, well cemented, Maximum Size medium sand, Color Brown, Moisture slightly moist.		0	0
					Auger refusal at 7.5' in hard sandstone.			

REMARKS Drilled by Northern Engineering and Testing, Inc
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger.
After auger removed, hole stayed open
Auger refusal at 7.5 feet in hard sandstone.
Hole Backfilled 10/03/83 - Drilled 85' north of station 805+59

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-375 DWG NO GTF-CON 8086

116

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-391

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 656+60 - 5' Left Coordinates N 228,046 E 1,521,509 Ground Elevation 3698 Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 10/29/83 Logged By W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—"UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
		0.5			0.0' - 0.5' TOPSOIL - about 30% fine sand, 50% medium plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist.		0	0
CL		2.0	SPT N = 76	6	0.5' - 2.0' SILTY CLAY - about 5% fine gravel, 25% fine to medium sand, 70% medium plasticity fines, Maximum Size 1" angular, Color Brown, Moisture slightly moist, very stiff, (CL).			
			SPT N=50/.3	8	2.0' - 11.0' SHALE CLAYSTONE - soft rock, thinly bedded, fractured, selenite, Colordao Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture slightly moist			
		11.0			11.0' - 12.0' SANDSTONE - hard rock, well cemented, partially fractured, Colorado Group, recovered as about 80% fine to medium sand, 20% non-plastic fines, Maximum Size medium sand, Color Brown, Moisture slightly moist			
		12.0			Auger refusal at 12.0' in hard sandstone.			

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Auger refusal at 12.0'.
Hole Backfilled 10/29/83 - Drilled at station 656+60, 5' left of centerline.
Hard Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-391 DWG NO GTF-CON 8088

118

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-400

Feature Great Falls - Conrad 230 KV Transmission Line State Montana
Station 573+76.17, 10' left Coordinates N 226,243 E 1,529,985 Ground Elevation 3512 Approx Dimensions 9" Auger
Date & Depth to Water 10/26/83 - 17.0' Method of Excavation Mobile B-50 Date 10/26/83 Logged By W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART—"UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
		0.5			0.0' - 0.5' TOPSOIL - about 20% fine sand, 60% medium plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist.			
SM			SPT N = 31	4	0.5' - 9.5' SILTY SAND - about 5% fine to coarse gravel, 70% fine to medium sand, 25% non-plastic fines, Maximum Size 2", Color Brown, Moisture slightly moist, dense, alluvial, (SM).		0	0
		9.5	SPT N = 21	6				
CL					9.5' - 15.0' SILTY CLAY - about 20% fine sand, 80% medium to high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, very stiff, alluvial, (CL).			
		15.0	SPT N = 25	26	15.0' - 21.5' SHALE CLAYSTONE - soft rock, thinly bedded, oxides, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture moist.		0	0
		17.0						
		21.5	SPT N = 70	35				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 21.5'
Hole Backfilled 10/26/83 - Drilled 10' south of PI 183
Easy to Hard Drilling
20' of 1½" diameter pvc pipe installed as observation well.

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-400 DWG NO GTF-CON 8090

119

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATION

Hole No AP 83-405

Feature Great Falls - Conrad 230 kV Transmission Line — State Montana
Station 525+80, 65' right — Coordinates N 226,144 E 1,534,293 — Ground Elevation 3537 — Approx Dimensions 18" Auger
Date & Depth to Water Not Encountered — Method of Excavation Power Pole Auger — Date 10/04/83 — Logged by D. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOLS (LETTER)	DEPTH (FEET)	SAMPLE TYPE & NO.	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIALS (SEE CHART, UNIFIED SOIL CLASSIFICATION AND ON PLACE DESCRIPTION FOR FOUNDATION INVESTIGATION)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3" TO 5" INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
	0.0			0.0' - 0.4' TOPSOIL - about 10 fine sand, 80 low plasticity fines, 10% organic material, Maximum Size fine sand, Color Brown, Moisture moist to slightly moist, stiff.			
CL	0.4	S. Sack	18	0.4' - 5.5' SILTY CLAY - about 10 gravel size sandstone fragments, 15% sand, 75% low to medium plasticity fines, Maximum Size 1½" subangular, Color Brown, Moisture moist, stiff, (CL)	0	0	
	5.5	S Sack	15	5.5' - 19.0' CLAYEY SILT about 15% fine sand, 85% low plasticity fines, Maximum Size fine sand, Color Tan, Moisture moist, stiff, gravel size shale and sandstone fragments from 8.0' - 19.0', (ML			
		S Sack	15				
CL	19.0 20.0	S Sack	16	19.0 - 20.0' SILTY CLAY WITH GRAVEL - about 10 gravel, 15% sand, 75 medium plasticity fines, Maximum Size 2", Color Brown, Moisture moist, very stiff, (CL)			0

REMARKS: Drilled by Northern Engineering and Testing, Inc
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger.
After auger removed, hole stayed open.
Required Depth = 20.0', 10/04/83.
Hole Backfilled 10 04 83 - Drilled 5' northwest of PI 184.

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-405 — DWG NO GTF-CON 8091

120

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-410

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 474+75, 170' right — Coordinates N 226,065 E 1,539,188 — Ground Elevation 3557 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 10/26 83 — Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOLS (LETTER)	DEPTH (FEET)	SAMPLE TYPE & NO.	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIALS (SEE CHART, UNIFIED SOIL CLASSIFICATION AND ON PLACE DESCRIPTION FOR FOUNDATION INVESTIGATION)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3" TO 5" INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
	0.0			0.0' - 0.5' TOPSOIL - about 30% fine sand, 50% high plasticity fines, 20 organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist			
	0.5	SPT N= 85	11	0.5' - 9.5' SHALE CLAYSTONE soft rock, thinly bedded, oxides, selenite, Colorado Group, recovered as about 10 fine sand, 90 high plasticity fines, Maximum Size fine sand, Color Gray, Moisture slightly moist			
	9.5	SPT N = 24	36	9.5 - 16.5 BENTONITIC SHALE soft rock, rad group, recovered as about 10 fine sand, 90 high plasticity fines, Maximum Size fine sand, Color Gray to Green, Moisture moist, stiff, ayers of pure bentonite			
		SPT N=					
	16.5	SPT N=50		16.5' - 20.0' SANDSTONE - hard rock, thinly bedded, moderately cemented, Colorado Group, recovered as about 80 fine to medium sand, 20 non-plastic fines, Maximum Size medium sand, Color Brown, Moisture slightly moist			
	20.0						

REMARKS: Drilled by Northern Engineering and Testing, Inc
Mobile Drill, Mode B-50, with 9" hollowstem augers used
After augers removed, hole stayed open.
Required Depth = 20.0 .
Hole Backfilled 10/26/83 - Drilled 0 north of PI 185

Moderate Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-410 — DWG NO GTF-CON 8092

121

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATION

Hole No AP 83-415

Feature Great Falls - Conrad 230 kV Transmission Line — State Montana
Station 433+89.08, centerline — Coordinates N 225,748 E 1,543,464 — Ground Elevation 3664 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 10/26/83 — Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOLS (LETTER)	DEPTH (FEET)	SAMPLE TYPE & NO.	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART, UNIFIED SOIL CLASSIFICATION AND ON PLACE DESCRIPTION FOR FOUNDATION INVESTIGATION)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3" TO 5" INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
	0.0			0.0' - 0.5' TOPSOIL - about 30% fine to coarse sand, 50% low plasticity fines, 20% organic material, Maximum Size coarse sand, Color Brown, Moisture moist			
	0.5	SPT N= 6		0.5 - 20.9' SHALE CLAYSTONE - soft rock, Colorado Group, recovered as about 10 fine sand, 90 high plasticity fines, Maximum Size fine sand, Color Gray, Moisture moist			
		SPT N= 5					
		SPT N= 9					
		SPT N-50. 5					
	20.9	SPT N=50. 4	13				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open
Required Depth = 20.9'
Hole Backfilled 10/26 83 - Drilled 0' northwest of PI 186

Moderate Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-415 — DWG NO GTF-CON 8093

122

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-420

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 398+10, centerline — Coordinates N 222,802 E 1,545,496 — Ground Elevation 3777 — Approx Dimensions Auger
Date & Depth to Water Not Encountered — Method of Excavation Power Pole Auger — Date 10/04/83 — Logged by D. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOLS (LETTER)	DEPTH (FEET)	SAMPLE TYPE & NO.	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART, UNIFIED SOIL CLASSIFICATION AND ON PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3" TO 5" INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
	0.0			0.0' - 0.4' TOPSOIL - about 15% fine sand, 70% low to medium plasticity fines, 15% organic material, Maximum Size fine sand, Color Brown, Moisture moist, stiff.			
CL	0.4	S. Sack	14	0.4' - 4.0' SILTY CLAY - about 15 fine sand, 85% medium plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, stiff to very stiff, (CL)			
	4.0	S. Sack	6	4.0' - 6.1' SHALE CLAYSTONE - soft rock, Colorado Group, recovered as about 25 fine sand, 75 high plasticity fines, Maximum Size fine sand, Color Dark Gray, Moisture slightly moist	0		
	6.1			6.1 - 6.2' SANDSTONE hard rock, Colorado Group, recovered as about 80 fine sand, 20% non-plastic fines, Maximum Size fine sand, Color Brown, Moisture slightly moist			
	6.2			Auger refusal at 6.2' in hard sandstone			

REMARKS: Drilled by Northern Engineering and Testing, Inc
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger.
After auger removed, hole stayed open
Auger refusal at + 2 feet in hard sandstone.
Hole Backfilled 10 04/83 - Drilled 9' northwest of PI 187.

NOTE Unless otherwise indicated % by volume of 3 5 & plus 5 material is estimated

HOLE NO AP 83-420 — DWG NO GTF-CON 8094

123

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Hole No PR 83-425 — Coordinates N 219,077 E 1,548,065 — Ground Elevation 3550
Depth and Elev of Water Level 16.0' — Location 352+85.10, centerline — Total Depth 20.0 feet
Date Measured 10/26/83 — Date Begun 10/26/83 — Finished 10/26/83 — Logged by W Henning — Reviewed by A. Stilley

NOTES (Mud losses, type and size of hole, drilling method and conditions, Caving and other information)

Drilled By
Northern Engineering and Testing, Inc

Drill Equipment
Mobile B-50 Rotary, Truck-mounted

Driller
B Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below.

Drive Sample Intervals, Feet
3. - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0

Progress Report
0 - 20.0', 10 26 83
After augers were removed, hole remained open
20.0' of perforated 4" diameter pvc pipe installed as observation well
Moderate drilling
Drilled 7' south of PI 188.

Hole Backfilled
10/26 83

CORE RECOVERY %	BLOWS / FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT)	GRAPHIC LOG
67	39	8		0.5	
87	29	18		10	CL
87	12	16		12.0	SM
87	30	30		16.0	
				20.0	
				30	
				40	
				50	
				60	
				70	
				80	
				90	

PENETRATION RESISTANCE
Blows per Foot
Weight of Hammer 140 lb
Height of Drop 30 in

0 10 20 30 40 50

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 20 fine sand, 60 high plasticity fines, 20 organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist.

0.5'-12.0' SILTY CLAY - about 20% fine sand, 80% medium plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, very stiff, alluvial, (CL)

12.0 -16.0' SILTY SAND - about 5 medium gravel, 70% fine to medium sand, 25% non-plastic fines, Maximum Size 2" angular, Color Brown, Moisture moist, medium dense. (SM)

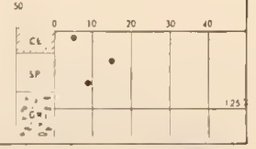
16.0'-20.0' SHALE CLAYSTONE - soft rock, thinly bedded, fractured, Colorado Group, recovered as about 10 fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture moist.

EXPLANATION

BLOWS FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated. Thus 50 4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows / foot

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE POORLY GRADED SAND 95% predominantly medium sand 5% nonplastic fines Max size 1 4 inch Rim moist gray uncemented ISPT

PENETRATION RESISTANCE — Plot as shown at right. Actual values ● extrapolated values at 50 open circle with extrapolated value 125.



FEATURE Great Falls-Conrad 230 KV Transmission Line — STATE Montana — HOLE NO PR 83-425 — DWG NO GTF-CON 8096

124

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-426

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 348+39 - Centerline — Coordinates N 219,022 E 1,548,507 — Ground Elevation 3547 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 10/29/83 — Logged by W. Henning

Unified Soil Classification Symbol Letter	Graphic	Depth (Feet)	Size and Type of Sample Taken	In Place Moisture (%)	Classification and Description of Material (See Chart—Unified Soil Classification. Give Geologic and In Place Description for Foundation Investigations)	Percent Moisture	Percentage by Volume of 3-5 Inch	Percentage by Volume of Plus 5-Inch
		0.5			0.0' - 0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture moist.			
			SPT N = 11	22				
CH					0.5' - 16.0' FAT CLAY - about 20% fine sand, 80% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, stiff, alluvial, (CH).		0	0
			SPT N = 14	22				
		16.0			16.0' - 21.5' SHALE CLAYSTONE - soft rock, thinly bedded, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture moist.			
			SPT N = 15	34				
		21.5	SPT N = 62	22				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 21.5'.
Hole Backfilled 10/29/83 - Drilled at station 348+39 centerline

Moderate Drilling

NOTE Unless otherwise indicated % by volume of 3-5" & plus 5" material is estimated

HOLE NO AP 83-426 — DWG NO GTF-CON 8096

125

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-427

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 345+44, 5' right — Coordinates N 218,990 E 1,548,801 — Ground Elevation 3548 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 10/29/83 — Logged by W. Henning

Unified Soil Classification Symbol Letter	Graphic	Depth (Feet)	Size and Type of Sample Taken	In Place Moisture (%)	Classification and Description of Material (See Chart—Unified Soil Classification. Give Geologic and In Place Description for Foundation Investigations)	Percent Moisture	Percentage by Volume of 3-5 Inch	Percentage by Volume of Plus 5-Inch
		0.5			0.0' - 0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture moist.			
CH			SPT N = 7	37	0.5' - 5.0' FAT CLAY - about 20% fine sand, 80% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, soft, alluvial, (CH).		0	0
		5.0			5.0' - 10.0' SHALE CLAYSTONE - soft rock, thinly bedded, fractured, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture slightly moist.			
			SPT N = 47	21				
		10.0			10.0' - 11.0' SANDSTONE - hard rock, well cemented, Colorado Group, recovered as about 80% fine to medium sand, 10 non-plastic fines, Maximum Size medium sand, Color Brown, Moisture moist.			
		11.0			Auger refusal at 11.0' in hard sandstone.			

REMARKS: Drilled by Northern Engineering and Testing, Inc
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open
Auger refusal at 11.0'.
Hole Backfilled 10/29/83 - Drilled at station 345+44, 5' right of centerline.

Hard Drilling

NOTE Unless otherwise indicated % by volume of 3-5 & plus 5 material is estimated

HOLE NO AP 83-427 — DWG NO GTF-CON 8097

126

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Hole No PR 83-430 — Coordinates N 218,749 E 1,550,749 — Ground Elevation 3639
Depth and Elev of Water Level* Not Encountered — Location Station 325+81.01, 10' right — Total Depth 20.8 feet
*Date Measured 10/26/83 — Date Begun 10/26/83 — Finished 10/26/83 — Logged by W. Henning — Reviewed by A. Stilley

NOTES
Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50
Rotary, Truck-mounted

Driller
B. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below

Drive Sample Intervals, Feet
3.0 - 4.5
8.0 - 9.5
13.0 - 14.0
20.0 - 20.8

Progress Report
0 - 20.8', 10/26/83
After augers were removed, hole remained open
Moderate drilling
Drilled 10' east of PT 189.

Hole Backfilled
10/26/83

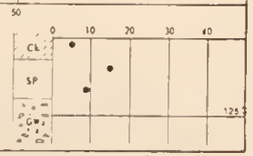
Core Recovery %	Blows per Foot	Water Content %	Samples for Testing	Depth (Ft.)	Graphic Log	Penetration Resistance (Blows per Foot)	Classification and Description of Material
				0.5		Weight of Hammer 140 lb; Height of Drop 30 in.	
87	78	6	SPT			78	0.0'-0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist.
0	68		SPT	10		68	
87	50/.5	5	SPT			100	0.5'-20.8' SHALE CLAYSTONE - soft rock, thinly bedded, fractured, oxides, selenite, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture slightly moist
93	50/.3	8	SPT	20.8		167	
				30			
				40			
				50			
				60			
				70			
				80			
				90			

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated thus, 50 - 4 indicates 0.4 foot penetrated with 50 blows, extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on in-place condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, damp, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125.



FEATURE Great Falls-Conrad 230 KV Transmission Line — STATE Montana — HOLE NO PR 83-430 — DWG NO GTF-CON 8098

127

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-431

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 303+02, Centerline — Coordinates N 216,461 E 1,550,773 — Ground Elevation 3540 — Approx Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 10/27/83 — Logged by W. Henning

Unified Soil Classification Symbol Letter	Graphic	Depth (Feet)	Size and Type of Sample Taken	In Place Moisture (%)	Classification and Description of Material (See Chart—Unified Soil Classification. Give Geologic and In Place Description for Foundation Investigations)	Percent Moisture	Percentage by Volume of 3-5 Inch	Percentage by Volume of Plus 5-Inch
			SPT N = 62	24	0.0' - 20.3' SHALE CLAYSTONE - soft rock, thinly bedded, selenite, oxides, scattered bentonite seams, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture moist.			
			SPT N = 45	24				
			SPT N = 58	21				
		20.3	SPT W=50/.3	20				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.3'.
Hole Backfilled 10/27/83 - Drilled at station 303+02.

Moderate to Difficult Drilling

NOTE Unless otherwise indicated % by volume of 3-5 & plus 5 material is estimated

HOLE NO AP 83-431 — DWG NO GTF-CON 8099

128

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature: Great Falls - Conrad 230 kV Transmission Line — State: Montana

Hole No: PR 83-435 — Coordinates N: 215,635 — E: 1,550,783 — Ground Elevation: 3523

Depth and Elev of Water Level*: Not Encountered — Location: Station 294+77.61, centerline — Total Depth: 20.8 feet

*Date Measured: 10-27-83 — Date Begun: 10-27-83 — Finished: 10/27/83 — Logged by: W. Henning — Reviewed by: A. Stilley

NOTES
Water losses, type and size of hole, drilling method and conditions, Caving, and other information

Drilled By
Northern Engineering and Testing, Inc

Drill Equipment
Mobile B-50
Rotary, truck-mounted.

Driller
B. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below

Drive Sample Intervals, feet
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
20.0 - 20.8

Progress Report
0' - 20.8', 10/27/83
After augers were removed, hole remained open.
Moderate to difficult drilling.
Drilled 8' north of PI 190.

Hole Backfilled 10/27/83

CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT)	GRAPHIC LOG	CLASSIFICATION AND DESCRIPTION OF MATERIAL
				0.5	CH	
67	13	21	SPT	5.0		0.0'-0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist
87	50	19	SPT	10		0.5'-5.0' FAT CLAY - about 20% fine sand, 80% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture moist, stiff, slope wash, (CH)
87	92	15	SPT	20.8		5.0'-20.8' SHALE CLAYSTONE - soft rock, thinly bedded, selenite, some bentonite lenses, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture moist
93	107.3	15	SPT			
				30		
				40		
				50		
				60		
				70		
				80		
				90		

PENETRATION RESISTANCE
Blows per F-ot
Weight of Hammer: 140 lb
Height of Drop: 30 in

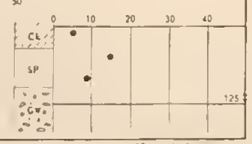
0 10 20 30 40 50

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated thus: 50 - 4 indicates 0.4 foot penetrated with 50 blows; extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND - 95% predominantly medium sand, 5% nonplastic fines, max size 1.4 inch, firm, moist, clay cemented (SP).

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125.



FEATURE: Great Falls-Conrad 230 kV Transmission Line — STATE: Montana — HOLE NO PR 83-435 — DWG NO GTF-CON 8100

129

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-440

Feature: Great Falls - Conrad 230 kV Transmission Line — State: Montana
Station: 250+30.29, centerline — Coordinates N 214,602 — E 1,555,101 — Ground Elevation: 3545 — Approx Dimensions: 9" Auger
Date & Depth to Water: 10/27/83, 9.0' — Method of Excavation: Mobile B-50 — Date: 10/27/83 — Logged By: W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOLS (LETTER)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART- UNIFIED SOIL CLASSIFICATION; GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATION)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
	0.5			0.0 - 0.5' TOPSOIL - about 5% fine grave , 20 fine sand, 55 high plasticity fines, 20% organic material, Maximum Size 1/2" subangular, Color Brown, Moisture slightly moist.			
CL	5.0	N = 30		0.5' - 9.0' SILTY CLAY - about 20% fine sand, 80% medium plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, soft, alluvial, (CL).	0	0	
	9.0	SPT N = 41	8	9.0' - 12.0' SHALE CLAYSTONE - soft rock, thinly bedded, selenite, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist			
	12.0			Auger refusal at 12.0' in hard sha e			

REMARKS: Drilled by Northern Engineering and Testing, Inc
Mobile Drill, Model B-50, with 9" hollowstem augers used
After augers removed, ho e stayed oper
Auger refusal at 12.0'.
Hole Backfilled 10/27/83 - Drilled 9' northwest of PI 191

Easy Drilling
2" of 1½" diameter pvc pipe installed as observation well.

NOTE: Unless otherwise indicated % by volume of 3-5 & plus 5" material is estimated

HOLE NO: AP 83-440 — DWG NO: GTF-CON 8101

130

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-441

Feature: Great Falls - Conrad 230 kV Transmission Line — State: Montana
Station: 232+35, centerline — Coordinates N 213,512 — E 1,556,525 — Ground Elevation: 3524 — Approx Dimensions: 18" Auger
Date & Depth to Water: Not Encountered — Method of Excavation: Power Pole Auger — Date: 10/04/83 — Logged By: O. Sykora

UNIFIED SOIL CLASSIFICATION SYMBOLS (LETTER)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART- UNIFIED SOIL CLASSIFICATION; GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
	0.2			0.0 - 0.2 TOPSOIL - about 10% fine sand, 70% low plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist			
CL	4.7	S. Sack	23	0.2' - 4.7' SILTY CLAY - about 10% fine sand, 90% medium plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist, stiff to very stiff, (CL)	0	0	
		S. Sack	24	4.7 - 20.0' SHALE CLAYSTONE - soft rock, thinly bedded, oxides, Colorado Group, recovered as about 5% fine sand, 95% high plasticity fines, Maximum Size fine sand, Color Dark Gray, Moisture moist	0	0	
		S. Sack	17				
	20.0	S. Sack	18				

REMARKS: Drilled by Northern Engineering and Testing, Inc
Power Pole Auger - Truck-mounted, Highway (Model HCAMS) with 18" auger
After auger removed, hole stayed open
Required Depth = 20.0', 10/04/83.
Hole Backfilled 10/04.83 - Drilled 8' northwest of station 232+27.

NOTE: Unless otherwise indicated % by volume of 3-5 & plus 5" material is estimated

HOLE NO: AP 83-441 — DWG NO: GTF-CON 8102

131

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-442

Feature: Great Falls - Conrad 230 kV Transmission Line — State: Montana
Station: 212+64 - 5' Right — Coordinates N 212,376 — E 1,558,093 — Ground Elevation: 3498 — Approx Dimensions: 9" Auger
Date & Depth to Water: Not Encountered — Method of Excavation: Mobile B-50 — Date: 10/28/83 — Logged By: W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOLS (LETTER)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART- UNIFIED SOIL CLASSIFICATION; GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
	0.5			0.0' - 0.5' TOPSOIL - about 30% fine sand, 50% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist			
CL		SPT N = 49	8	0.5' - 12.0' SILTY CLAY - about 5% fine gravel, 20% fine sand, 75% medium plasticity fines, Maximum Size 1" subangular, Color Brown, Moisture slightly moist, hard, alluvial, (CL).	0	0	
		SPT N = 58	13				
	12.0			12.0' - 20.0' FAT CLAY - about 20% fine sand, 80% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist, hard, lacustrine, more sandy with depth, (CH)			
CH		SPT N = 32	21			0	0
	20.0	SPT N = 24	15				

REMARKS: Drilled by Northern Engineering and Testing, nc
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open
Required Depth = 20.0'
Hole Backfilled 10/28/83 - Drilled 5' right of station 212+64

Moderate Drilling

NOTE: Unless otherwise indicated % by volume of 3-5 & plus 5" material is estimated

HOLE NO: AP 83-442 — DWG NO: GTF-CON 8103

132

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-445

Feature: Great Falls - Conrad 230 kV Transmission Line — State: Montana
Station: 209+76.62, centerline — Coordinates N 211,834 — E 1,558,213 — Ground Elevation: 3482 — Approx Dimensions: 9" Auger
Date & Depth to Water: Not Encountered — Method of Excavation: Mobile B-50 — Date: 10/27/83 — Logged By: W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOLS (LETTER)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE (%)	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART- UNIFIED SOIL CLASSIFICATION; GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
	0.5			0.0' - 0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist			
CL		SPT N = 17	6	0.5' - 5.0' SILTY CLAY - about 5% medium to fine gravel, 25% fine to medium sand, 70% medium plasticity fines, Maximum Size 1" angular, Color Brown, Moisture moist, very stiff, alluvial, (CL).	0	0	
	5.0						
		SPT N = 12	9	5.0' - 14.5' SANDY SILT - about 30% fine sand, 70% low plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist, medium dense, alluvial, (ML).			
ML						0	0
	14.5	SPT N = 26	7	14.5' - 20.0' SILTY CLAY - about 20% fine sand, 80% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, very stiff, alluvial, (CL)			
CL						0	0
	20.0	SPT N = 30	17				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used
After augers removed, hole stayed open
Required Depth = 20.0'
Hole Backfilled 10/27 83 - Drilled 10' northwest of PI 192

Easy Drilling

NOTE: Unless otherwise indicated % by volume of 3-5 & plus 5" material is estimated

HOLE NO: AP 83-445 — DWG NO: GTF-CON 8104

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line State Montana

Hole No PR 83-450 Coordinates N 211,671 E 1,559,953 Ground Elevation 3487

Depth and Elev of Water Level* Not Encountered Location Station 192+26, centerline Total Depth 20.2 feet

*Date Measured 10/27/83 Date Begun 10/27/83 Finished 10/27/83 Logged by W. Henning Reviewed by A. Stilley

NOTES
Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50 Rotary, Truck-mounted.

Driller
B. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below

Drive Sample Intervals, Feet
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
19.5 - 20.2

Progress Report
0 - 20.2', 10/27/83
After augers were removed, hole remained open
Moderate drilling.
Drilled 25' east of PI 192.

Hole Backfilled 10/27/83

CORE RECOVERY, %	BLOWS/FOOT	WATER CONTENT, %	SAMPLES FOR TESTING	DEPTH (FT)
87	44	10	CBT	0.5
80	42	25	CBT	10
87	30	19	SPT	
87	50/.2	8	SPT	20.2

PENETRATION RESISTANCE
Blows per Foot
Weight of Hammer 140 lb
Height of Drop 30 in

GRAPHIC LOG: CH

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture slightly moist.

0.5'-20.2' FAT CLAY - about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture moist, very stiff, lacustrine, (CH).

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated (thus .30/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 30, open circle with extrapolated value 125.

FEATURE Great Falls-Conrad 230 KV Transmission Line STATE Montana HOLE NO PR 83-450 DWG NO GTF-CON 8105

LOG OF TEST PIT OR AUGER HOLE FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-455

Feature Great Falls - Conrad 230 kV Transmission Line State Montana

Station 178+26.29, centerline Coordinates N 211,495 E 1,561,342 Ground Elevation 3494 Approx Dimensions 9" Auger

Date & Depth to Water Not Encountered Method of Excavation Mobile B-50 Date 10/27/83 Logged by W. Henning

UNIFIED CLASSIFICATION SYMBOL (CLIFF)	(TEST)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION SYSTEM) GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3 INCH	PERCENTAGE BY VOLUME OF PLUS 3 INCH
		0.5	SPT N=50/.3	6	0.0' - 1.0' TOPSOIL - about 5% fine gravel, 20% fine sand, 55% high plasticity fines, 20% organic material, Maximum Size 1/2", Color Brown, Moisture moist.			
			SPT N=50/.3	7	0.5' - 20.4' SANDSTONE - hard rock, thinly bedded, poorly to well cemented, some oxides, Colorado Group, recovered as about 70% fine to medium sand, 30% non-plastic fines, Maximum Size medium sand, Color Brown, Moisture slightly moist.			
			SPT N=50/.3	5				
		20.4	SPT N=20/.4	7				

REMARKS Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.4'.
Hole Backfilled 10/27/83 - Drilled 8' east of PI 193.

Difficult Drilling

NOTE Unless otherwise indicated, the material at 3.5' & plus 5' material is estimated

HOLE NO AP 83-455 DWG NO GTF-CON 8106

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 kV Transmission Line State Montana

Hole No PR 83-460 Coordinates N 209,361 E 1,564,667 Ground Elevation 3655

Depth and Elev of Water Level* Not Encountered Location Station 138+75, centerline Total Depth 20.0 feet

*Date Measured 10/27/83 Date Begun 10/27/83 Finished 10/27/83 Logged by W. Henning Reviewed by A. Stilley

NOTES
Water losses, type and size of hole, drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50 Rotary, Truck-mounted

Driller
E. Neff

Method
Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below

Drive Sample Intervals, Feet
3.0 - 4.5
8.0 - 9.5
13.0 - 14.5
18.5 - 20.0

Progress Report
0 - 20.0', 10/27/83
After augers were removed, hole remained open.
Easy drilling.
Drilled 10' east of PI 194

Hole Backfilled 10/27/83

CORE RECOVERY, %	BLOWS/FOOT	WATER CONTENT, %	SAMPLES FOR TESTING	DEPTH (FT)
30	6	27	CBT	0.5
87	11	37	CBT	
90	28	26	CBT	16.0
50	50	6	CBT	20.0

PENETRATION RESISTANCE
Blows per Foot
Weight of Hammer 140 lb
Height of Drop 30 in

GRAPHIC LOG: CH

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture moist.

0.5'-16.0' FAT CLAY - about 20% fine sand, 80% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, soft, Lacustrine, (CH).

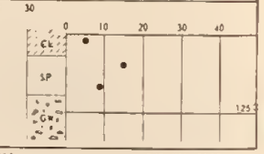
16.0'-20.0' SHALE SANDY - soft rock, scattered sandstone lenses, Colorado Group, recovered as about 30% fine sand, 70% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture slightly moist.

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated (thus .30/.4 indicates 0.4 foot penetrated with 30 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 30, open circle with extrapolated value 125.



FEATURE Great Falls-Conrad 230 KV Transmission Line STATE Montana HOLE NO PR 83-460 DWG NO GTF-CON 8107

136

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No: AP 83-461

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana
Station: 129+80, centerline — Coordinates: N 208,878 E 1,565,420 — Ground Elevation: 3461 — Approx. Dimensions: 9" Auger
Date & Depth to Water: Not Encountered — Method of Excavation: Mobile B-50 — Date: 10/27/83 — Logged by: W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL (LETTER)	(GRAPHIC)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION. GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-.5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
		0.5			0.0' - 0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture moist.		0	0
CL		2.0	SPT N = 23	14	0.5' - 2.0' SANDY CLAY - about 10% medium gravel, 30% fine sand, 60% medium plasticity fines, Maximum Size 2" angular, Color Brown, Moisture moist, very stiff, road fill, (CL).		0	0
CH		12.0	SPT N = 25	20	2.0' - 12.0' FAT CLAY - about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, very stiff, lacustrine, (CH).			
			SPT N = 38	14	12.0' - 20.0' SHALE CLAYSTONE - soft rock, thinly bedded, fractured, some selenite, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture slightly moist			
		20.0	SPT N = 50	12				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.0'.
Hole Backfilled 10/27/83 - Drilled at station 129+80.

Moderate Drilling

NOTE: Unless otherwise indicated % by volume of 3-.5 & plus 5" material is estimated

HOLE NO: AP 83-461 — DWG NO: GTF-CON 8108

137

SUBSURFACE EXPLORATION · PENETRATION RESISTANCE AND LOG

Feature: Great Falls - Conrad 230 kV Transmission Line — State: Montana

Hole No: PR 83-465 — Coordinates N 206,707 E 1,568,802 — Ground Elevation: 3441
Depth and Elev of Water Level*: Not Encountered — Location: Station 89+60.87, centerline — Total Depth: 20.8 feet
*Date Measured: 10/28/83 — Date Begun: 10/28/83 — Finished: 10/28/83 — Logged by: W. Henning — Reviewed by: A. Stilley

NOTES
Water losses, type and size of hole drilling method and conditions, Caving and other information

Drilled By
Northern Engineering and Testing, Inc.

Drill Equipment
Mobile B-50
Rotary, Truck-mounted

Driller
B. Hoff

Method
Drilled with 9" diameter hollow stem augers. Drive sample (SPT) taken at the intervals listed below.

Drive Sample Intervals, Feet
3.0 - 4.5
8.0 - 9.5
13.0 - 14.0
20.0 - 20.8

Progress Report
- 20.0', 10/28/83
After augers were removed, hole remained open
Easy Drilling
Drilled 8' south of PI 195

Hole Backfilled
10/28/83

CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT)	GRAPHIC LOG
87	25	26	SPT	0.5	
87	39	15	SPT		CH
93	50/.5	15	SPT	11.0	
87	50/.3	11	SPT	20.8	

PENETRATION RESISTANCE
Blows per Foot
Weight of Hammer: 140 lb
Height of Drop: 30 in

0 10 20 30 40 50
100
167

CLASSIFICATION AND DESCRIPTION OF MATERIAL

0.0'-0.5' TOPSOIL - about 10% fine sand, 60% high plasticity fines, 30% organic material, Maximum Size fine sand, Color Brown, Moisture moist

0.5'-11.0' FAT CLAY - about 20% fine sand, 80% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, very stiff, lacustrine, (CH)

11.0'-20.8' SHALE CLAYSTONE - soft rock, thinly bedded, fractured, Colorado Group, recovered as about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Gray, Moisture slightly moist.

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated. Thus .50 .4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines max size 1.4 inch, dim, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot, as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125.

FEATURE: Great Falls-Conrad 230 KV Transmission Line — STATE: Montana — HOLE NO: PR 83-465 — DWG NO: GTF-CON 8105

138

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No: AP 83-466

Feature: Great Falls - Conrad 230 KV Transmission Line — State: Montana
Station: 65+63, centerline — Coordinates: N 206,667 E 1,571,199 — Ground Elevation: 3308 — Approx. Dimensions: 9" Auger
Date & Depth to Water: Not Encountered — Method of Excavation: Mobile B-50 — Date: 10/28/83 — Logged by: W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL (LETTER)	(GRAPHIC)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION. GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-.5 INCH	PERCENTAGE BY VOLUME OF PLUS 5-INCH
		0.5			0.0' - 0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture moist.			
CH			SPT N = 40	24	0.5' - 20.0' FAT CLAY - about 20% fine sand, 80% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, very stiff to hard, lacustrine, (CH).		0	0
			SPT N = 20	27				
			SPT N = 63	28				
		20.0	SPT N = 68	26				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used.
After augers removed, hole stayed open.
Required Depth = 20.0'.
Hole Backfilled 10/28/83 - Drilled 5' north of station 65+63.

Moderate Drilling

NOTE: Unless otherwise indicated % by volume of 3-.5 & plus 5" material is estimated

HOLE NO: AP 83-466 — DWG NO: GTF-CON 8110

139

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 kV Transmission Line — State Montana

Hole No PR 83-470 — Coordinates N 206,638 — E 1,572,895 — Ground Elevation 3379

Depth and Elev of Water Level* Not Encountered — Location Station 48+66.91, centerline — Total Depth 20.0 feet

*Date Measured 10/28/83 — Date Begun 10/28/83 — Finished 10/28/83 — Logged by K. Henning — Reviewed by A. Stilley

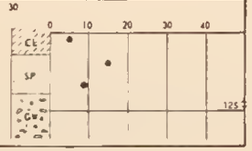
NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information	CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT.)	GRAPHIC LOG	PENETRATION RESISTANCE Blows per Foot (Weight of Hammer 140 lb, Height of Drop 30 in)	CLASSIFICATION AND DESCRIPTION OF MATERIAL
Drilled By Northern Engineering Testing, Inc.	87	38	17	SPT	0.5	CH	0 10 20 30 40 50	0.0'-0.5' TOPSOIL - about 20 fine sand, 60 high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture moist.
Drill Equipment Mobile B-50 Rotary, Truck-mounted.	90	41	24	SPT	10			0.5'-20.0' FAT CLAY - about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, salts hard, lacustrine, (CH).
Driller S. Neff	87	41	24	SPT				
Method Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below.	93	47	24	SPT	20.0			
Drive Sample Intervals, Feet: 3.0 - 4.5; 8.0 - 9.5; 13.0 - 14.5; 18.5 - 20.0					30			
Progress Report 0 - 20.0', 10/28/83 After augers were removed, hole remained open Easy drilling. Drilled 10' southeast of PI 196.					40			
Hole Backfilled 10/28/83					50			
					60			
					70			
					80			
					90			

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated, thus: 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125○



FEATURE Great Falls-Conrad 230 kV Transmission Line — STATE Montana — HOLE NO PR 83-470 — DWG NO GTF-CON 8111

140

LOG OF TEST PIT OR AUGER HOLE FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-475

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Station 40+54.60, 7' right — Coordinates N 206,177 — E 1,573,561 — Ground Elevation 3389 — Approx Dimensions 9" Auger

Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 10/28/83 — Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL (COARSE / FINE)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (USE CHART — UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
CH	0.5	SPT N = 17	32	0.0' - 0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture moist			
		SPT N = 28	23	0.5' - 20.0' FAT CLAY - about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, very stiff, lacustrine, (CH)		0	0
		SPT N = 26	23				
	20.0	SPT N = 20	19				

REMARKS: Drilled by Northern Engineering and Testing, Inc. Mobile Drill, Model B-50, with 9" hollowstem augers used. After augers removed, hole stayed open. Required Depth = 20.0'. Hole Backfilled 10/28/83 - Drilled at station 40+54.60, 7' right of centerline. Easy Drilling

NOTE: Unless otherwise indicated % by volume of 3-5 & plus 5 material is estimated

HOLE NO AP 83-475 — DWG NO GTF-CON 8112

141

LOG OF TEST PIT OR AUGER HOLE FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-476

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Station 32+73 - 5' Left — Coordinates N 205,488 — E 1,573,853 — Ground Elevation 3390 — Approx Dimensions 9" Auger

Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 10/28/83 — Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL (COARSE / FINE)	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (USE CHART — UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3-5 INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
CH	0.5	SPT N = 65	14	0.0' - 0.5' TOPSOIL - about 20% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size fine sand, Color Brown, Moisture moist.			
		SPT N = 40	12	0.5' - 20.0' FAT CLAY - about 20% fine sand, 80% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, hard, lacustrine, (CH)		0	0
		SPT N = 95	16				
	20.0	SPT N = 85	16				

REMARKS: Drilled by Northern Engineering and Testing, Inc. Mobile Drill, Model B-50, with 9" hollowstem augers used. After augers removed, hole stayed open. Required Depth = 20.0'. Hole Backfilled 10/28/83 - Drilled at station 32+73, 5' left of centerline. Easy Drilling

NOTE: Unless otherwise indicated % by volume of 3-5 & plus 5 material is estimated

HOLE NO AP 83-476 — DWG NO GTF-CON 8113

142

SUBSURFACE EXPLORATION - PENETRATION RESISTANCE AND LOG

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana

Hole No PR 83-480 — Coordinates N 203,346 — E 1,574,730 — Ground Elevation 3374

Depth and Elev of Water Level* Not Encountered — Location Station 9+94, centerline — Total Depth 20.0 feet

*Date Measured 10/28/83 — Date Begun 10/28/83 — Finished 10/28/83 — Logged by K. Henning — Reviewed by A. Stilley

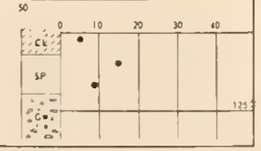
NOTES: Water losses, type and size of hole, drilling method and conditions, Caving and other information	CORE RECOVERY %	BLOWS/FOOT	WATER CONTENT %	SAMPLES FOR TESTING	DEPTH (FT.)	GRAPHIC LOG	PENETRATION RESISTANCE Blows per Foot (Weight of Hammer 140 lb, Height of Drop 30 in)	CLASSIFICATION AND DESCRIPTION OF MATERIAL
Drilled By Northern Engineering and Testing, Inc.	87	20	19	SPT	0.5	CL	0 10 20 30 40 50	0.0'-0.5' TOPSOIL - about 20 fine sand, 60 high plasticity fines, 20 organic material, Maximum Size fine sand, Color Brown, Moisture moist
Drill Equipment Mobile B-50 Rotary, Truck-mounted	93	32	18	SPT	10			0.5'-20.0' SILTY CLAY - about 5 medium gravel, 25% fine to coarse sand, 70% medium plasticity fines, Maximum Size 2" rounded, Color Brown, Moisture moist, very stiff glacial till, (CL).
Driller B. Neff	93	31	16	SPT				
Method Drilled with 9" diameter hollow-stem augers. Drive sample (SPT) taken at the intervals listed below.	93	48	17	SPT	20.0			
Drive Sample Intervals, Feet: 3.0 - 4.5; 8.0 - 9.5; 13.0 - 14.5; 18.5 - 20.0					30			
Progress Report 0 - 20.0', 10/28/83 After augers were removed, hole remained open Moderate drilling. Drilled 6' north of PI 197.					40			
Hole Backfilled 10/28/83					50			
					60			
					70			
					80			
					90			

EXPLANATION

BLOWS/FOOT — Record number of blows required for one foot of penetration. If 50 blows result in less than one foot of penetration, record depth penetrated, thus: 50/.4 indicates 0.4 foot penetrated with 50 blows extrapolated as 125 blows/foot.

CLASSIFICATION AND DESCRIPTION — Describe soil type with emphasis on inplace condition. Include Unified Soil Classification symbol. EXAMPLE: POORLY GRADED SAND, 95% predominantly medium sand, 5% nonplastic fines, max size 1/4 inch, firm, moist, gray, uncemented (SP).

PENETRATION RESISTANCE — Plot as shown at right. Actual values ●, extrapolated values at 50 open circle with extrapolated value 125○



FEATURE Great Falls-Conrad 230 kV Transmission Line — STATE Montana — HOLE NO PR 83-480 — DWG NO GTF-CON 8114

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-481

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 200' So. of Sta. 10+00 — Coordinates N 203,152 E 1,574,730 — Ground Elevation 3378 — Approx. Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 10/28/83 — Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3 5 INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
CH		0.5	SPT N = 48	20	0.0' - 0.5' TOPSOIL - about 5% fine gravel, 15% fine sand, 60% high plasticity fines, 20% organic material, Maximum Size 1/2" rounded, Color Brown, Moisture moist.		0	0
		5.0	SPT N = 22	21	0.5' - 5.0' FAT CLAY - about 20% fine sand, 80% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, hard, lacustrine, (CH).		0	0
CL			SPT N = 31	18	5.0' - 20.0' SILTY CLAY - about 5% fine gravel, 25% fine to medium sand, 70% medium plasticity fines, Maximum Size 1" rounded to subangular, Color Brown, Moisture moist, very stiff, glacial till, (CL)			
		20.0	SPT N = 33	17				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used
After augers removed, hole stayed open.
Required Depth = 20.0'.
Hole Backfilled 10/28/83 - Drilled 200' south of PI 197

Easy Drilling

NOTE Unless otherwise indicated % by volume of 3 5 & plus 5" material is estimated

HOLE NO AP 83-481 — DWG NO GTF-CON 8115

LOG OF TEST PIT OR AUGER HOLE
FOR BORROW AND FOUNDATION INVESTIGATIONS

Hole No AP 83-482

Feature Great Falls - Conrad 230 KV Transmission Line — State Montana
Station 400' So. of Sta. 10+00 — Coordinates N 202,952 E 1,574,729 — Ground Elevation 3373 — Approx. Dimensions 9" Auger
Date & Depth to Water Not Encountered — Method of Excavation Mobile B-50 — Date 10/28/83 — Logged by W. Henning

UNIFIED SOIL CLASSIFICATION SYMBOL LETTER	GRAPHIC	DEPTH (FEET)	SIZE AND TYPE OF SAMPLE TAKEN	IN PLACE MOISTURE %	CLASSIFICATION AND DESCRIPTION OF MATERIAL (SEE CHART — UNIFIED SOIL CLASSIFICATION GIVE GEOLOGIC AND IN PLACE DESCRIPTION FOR FOUNDATION INVESTIGATIONS)	PERCENT MOISTURE	PERCENTAGE BY VOLUME OF 3 5 INCH	PERCENTAGE BY VOLUME OF PLUS 5 INCH
CH		0.5	SPT N = 21	25	0.0' - 0.5' TOPSOIL - about 5% fine gravel, 25% fine sand, 70% high plasticity fines, Maximum Size 1/2" rounded, Color Brown, Moisture moist.			
			SPT N = 27	22	0.5' - 15.0' FAT CLAY - about 10% fine sand, 90% high plasticity fines, Maximum Size fine sand, Color Brown, Moisture moist, stiff, lacustrine, (CH).		0	0
		15.0	SPT N = 29	24	15.0 - 20.0' SILTY CLAY - about 5% gravel, 20% fine to medium sand, 75% medium plasticity fines, Maximum Size 1" rounded, Color Brown, Moisture moist, very stiff, glacial till, (CL).			
CL							0	0
		20.0	SPT N = 26	17				

REMARKS: Drilled by Northern Engineering and Testing, Inc.
Mobile Drill, Model B-50, with 9" hollowstem augers used
After augers removed, hole stayed open.
Required Depth = 20.0'.
Hole Backfilled 10/28/83 - Drilled 400' south of PI 197.

Easy Drilling

NOTE Unless otherwise indicated % by volume of 3 5 & plus 5" material is estimated

HOLE NO AP 83-482 — DWG NO GTF-CON 8116

DEPARTMENT OF ENERGY
UNITED STATES OF AMERICA